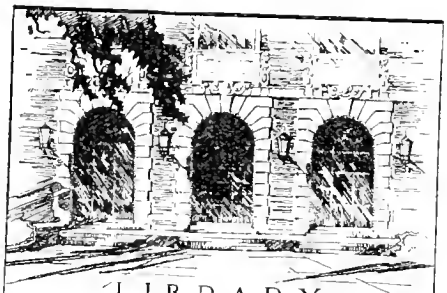


THE ILLINOIS TECHNOGRAPH

The First Technograph, 1885

....The pages that are missing were removed because they were advertisements.

MEMBER OF E. C. M. A.

THE C S. JOHNSON COMPANY

CHAMPAIGN, ILLINOIS

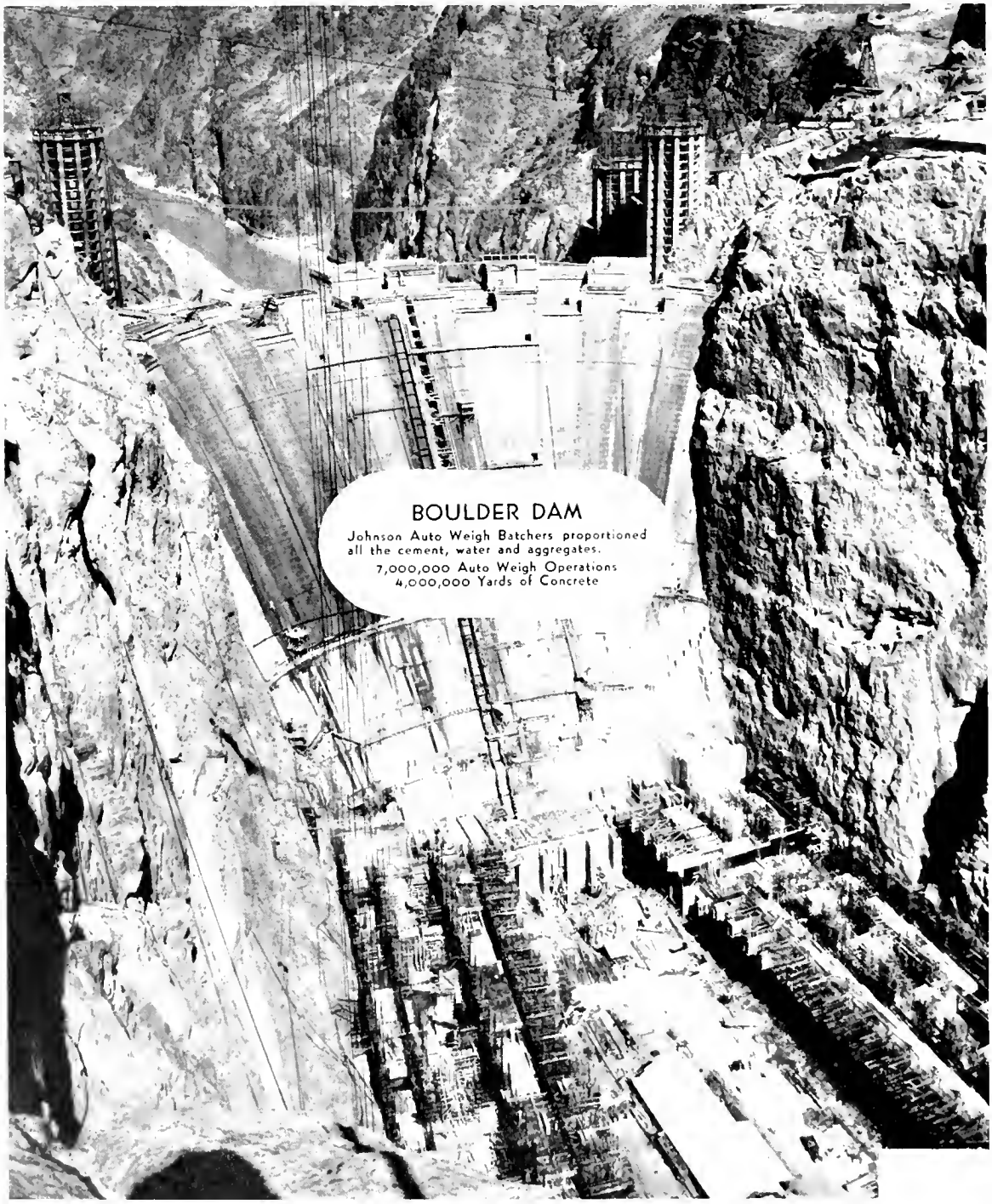
BATCHERS - BATCHING PLANTS - MATERIAL BINS

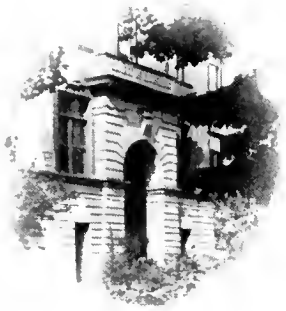
FOR

Large Production Jobs	Central Mixing Plants
Road Building	Truck Mixer Plants
Bridge Work	Cement Handling Plants
Culvert Work	Special Installations

The C. S. Johnson Company specializes in the design and production of equipment for Batching or Proportioning Materials, also Storage Bins and Plants.

The C. S. Johnson Company manufactures not only a standard line of Weigh Batchers and Bins but also designs and builds complete plants for all sizes and types of concrete jobs.





THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

SEPTEMBER, 1935

Volume 50 Number 1

WE PRESENT the first number of the fiftieth volume of the Illinois Technograph. The golden anniversary of the magazine has been appropriately celebrated by the publishing in this issue of the first half of the history of the Technograph. The magazine has undergone many changes since the first Technograph appeared in 1885. Read and enjoy this story of the life of your college magazine.

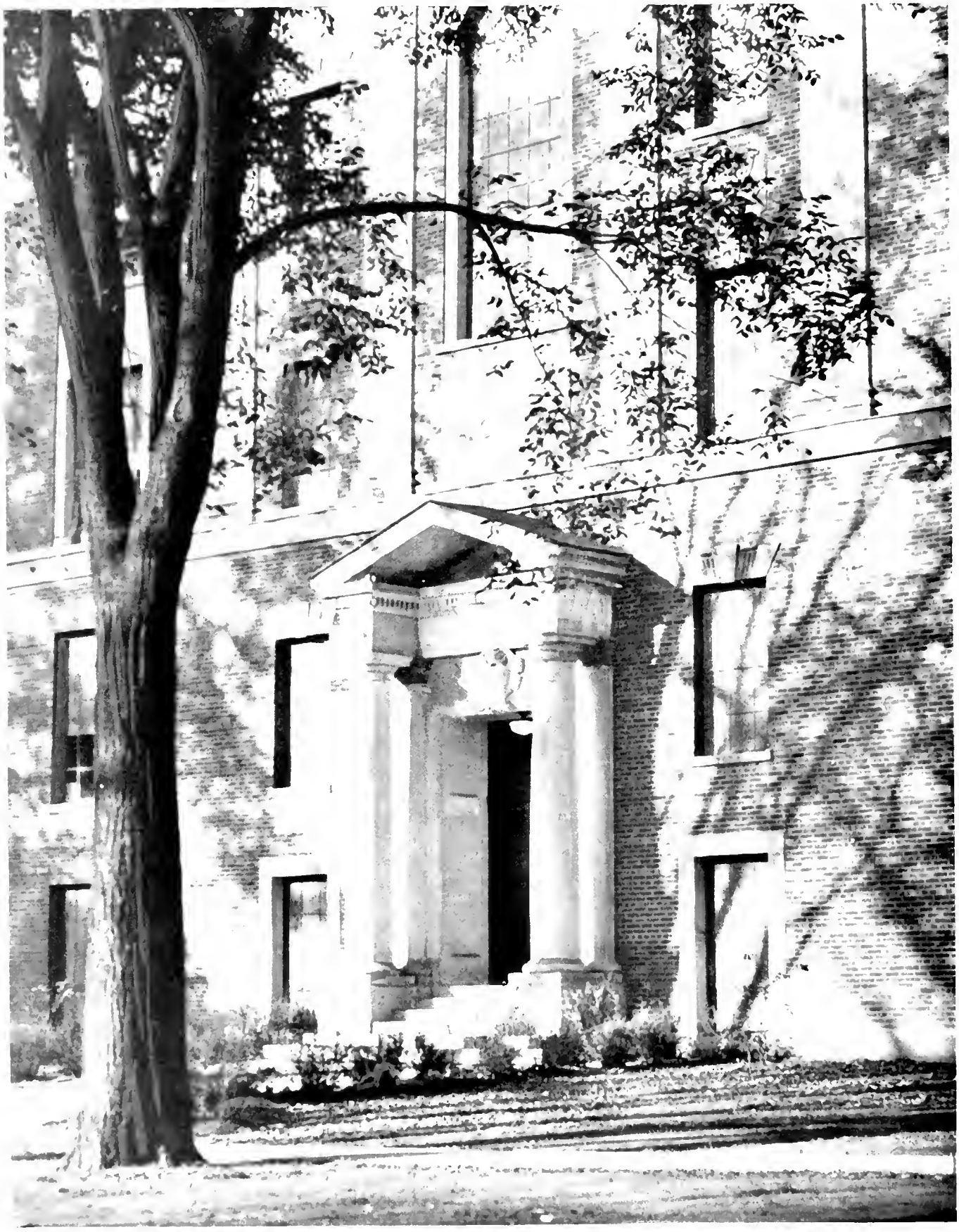
• The famous Technograph reporter, Kahn Chu, unfolds an interview with the friend of the engineers, Dean Enger, in which he passes on in his humorous way, the valuable points that the Dean brought out during his visit. Read the article and pick out for yourself the many things that will help you to have a most successful year.

• A story of the growth of our College is presented in a very interesting manner in this issue. It contains much material which we believe cannot be found elsewhere in such a convenient form. Although the article has necessitated a great deal of research on the part of the staff members, we feel certain that the readers will appreciate our efforts.

• We are indebted to a great number of contributors and staff members, without whose co-operation on this issue would not have been possible. We want to especially thank ED HONG, AL LEVY, JOHN SHERMAN, DAN RAPOPORT, GORDAN JEPPESEN, and JIM FITZGERALD for help on the editorial side, and REX NEWCOMB, JIM SKORCZ, WALT RENNER, and JIM STEIN for help on the business matters. We also thank our many contributors who have supplied us with much information without which we would have been lost.

Contents

Published four times during the year (September, December, February, and April) by the Illini Publishing Company. Entered as second class matter, October 30, 1921, at the post office of Urbana, Illinois. Office 213 Engineering Hall, Urbana, Illinois. Subscriptions, $1.00 per year. Single copy 30 cents.



Materials Testing Laboratory

THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume L | SEPTEMBER, 1935 | Number 1

Dean Enger Extends Greetings

Friend of Engineers Offers Advice

INTERVIEW BY MR. CHU

HON. DEAN M. L. Enger was standing by window in office taking deep breaths out of electric fan and looking over campus scene of plain and fancy students as Mr. Chu dash in with merry greetings after happy summer loaf.

"Perfect occasion," say Mr. Chu, showing best reporter form. "Rejoice to be back from long summer spell, get down hard work. Hope you enjoy trip west, Omaha, Denver, and etc. Catch big fish and game preserves; also sidetrack cares of office."

Dean turn from window, stride to desk. Chu glad to remark fine appearance, pleasant color, and five pound shortage. Dean tear date sheet from calendar, point to new day, this a. m.

"Vacation now over," he offer. "Forget fish and big game, forget all but hard work."

"You have pleasant word for newcomer and stranger in midst?" ask Chu, taking out pencil and slipping down cuff for notes.

"Please convey to new and old students best wishes in adjoining col," Dean remark, "also inform that first task should be join Hospital Association. This association like life insurance for pain and ache. Special bargain rate all semester to member in Class A-1 rating.

THE College of Engineering of the University of Illinois welcomes the great freshman class of 1939. To you and to the old students greetings and best wishes for a prosperous and busy year. I trust that you will take an active interest in the work and activities of the College and that you will find opportunities for growth and enrichment of your lives in the program of the College and of the University.

—DEAN M. L. ENGER.

"Fine game," say Chu. "Everybody win, nobody lose. Student will be wise join sick list."

"Next thing," say Dean taking off tie and putting down near floor to catch breath fresh air, "Student should seek adviser on faculty side. Very important have good chat with adviser. Suggest any student who can find member faculty to have talk with same.

"Good faculty man nowadays hard to," Chu chant, in words of old song. "Perhaps you offer prize to student which locates adviser advising."

"Equally wise offer prize to student if found taking advice," Dean rebut. "However, adviser system one of honorable traditions this establ. Hope freshmen make better start than some members Technograph staff."

"Appreciate personal attention," say Chu, taking off coat to make notes above elbow. "How about budget for clock hours, same as money?"

"Budget of time secret of good order," say Dean expanding chest from joy of fine physical condition. "Student should budget time, keep budget, and get good start right now to make year big success."

"Ben Franklin catch same idea some time back," Chu remark pleasantly. "Franklin also seize fore by timelock."

"Franklin didn't do so bad," say Dean. "Glad to see 1935 student make same run using same signals."

"Program of engineer very full," say Chu, changing unpleasant topic of hard work. "How about chance to refine cash customer?"

"Refining up to student," say Dean, "If student want fashionable topics, fancy appreciations, way is open. Student may elect first prize culture courses for free elective. Also chance is good to read; no rule to stop engineer from good reading budget. Student who wants culture pursues same, like child who wants to go to circus. Glad to recommend use splendid Engineer library. Ever look in same?"

"Have heard of library," say Chu, "Glad to know all are welcome to enjoy culture benefits. Big surprise for some. Please give extra word on smokers, college life, activities."

"Smoker event fine for college," say Dean. "All students need advantages of get together and social mixture. College spirit better with social event for all student leaders. Learn action lesson, make fine friends.

"Glad to have these pearls of wisdom," Chu invent, throwing away pencil and coat, hat and add items conceded to heat. "One last word, perhaps. How about work on Hon. Technograph?"

"Sometime I wonder," Dean deploy. Best men usually on magazine. Make fine record. Hope you are the same."

Khan Chu.

Some Facts and Figures On

The College of Engineering Today

Faculty Strength Maintained, Facilities Improved

STUDENTS and faculty of the College of Engineering today settled down to the grind of the 1935-36 school year with the prospect of the largest enrollment since the depression began to take its toll in 1931-32.

Rumors that several distinguished members of the faculty had been attracted by offers from other institutions and leading engineering and industrial concerns were dispelled as the senior men all returned to their posts. Professors H. F. Moore, H. M. Westergaard, and others who had been considering positions tendered them last spring have again cast their lot with Illinois and have declined appointment elsewhere. Professor Crandall, back from studies and travels in Europe, adds an element of strength to the personnel of the faculty and the impression prevails that the staff as a whole is at its best.

New Petroleum Option

A new option in petroleum engineering studies in engineering and geology, has been established with Professor W. V. Howard of the Department of Geology as sponsor. The basic work of this curriculum is much the same as that of the curriculum in mechanical engineering and Professor O. A. Leutwiler, head of the Department of Mechanical Engineering, is co-operating in the development of the new program. About twenty students have undertaken the work.

Provision for the mining and metallurgical engineering building annex was made by the last General Assembly and the work of construction and rearrangement of work is under way.

Mechanical Is Most Popular

Student enrollment and curricular preferences are coming in for their share of attention. Mechanical engineering is still the leader with a Technograph enrollment forecast of 283, a gain over the record of last year. Electrical engineering and civil engineering are in second and third place in size of student body, with the popular program in ceramics a strong fourth.

The registration in the ceramics curriculum may pass the 150 mark, though The Technograph estimate places the figure conservatively at 134. General engineering and ceramic engineering complete the roster of the larger curricula of the college. They will enroll fifty or more students.

Other Departments Increase

Growth is expected in the curricula in mining, railway options, engineering physics, gas engineering, metallurgy, agricultural engineering, and in the new petroleum engineering option.

Excluding the figures for chemical engineering and architecture, which are now listed with the totals for other colleges, the enrollment for the year will be 1,172, a gain of 26 over last year, The Technograph estimates.

How the student body has changed from year to year is an important part of the story of the College. On the opposite page will be found a complete chart of all curricula since the beginning of the engineering work in 1867. This chart indicates that the peak in enrollment has not yet been reached under the new cycle. In other days the number in certain curricula was above 500. The number in any single curriculum now is under 300. The largest enrollment in all curricula (excluding architecture and architectural engineering which are not counted at the present time) was 1,171. This means that the present year's record falls approximately 300 below the all-time peak enrollment of the College.

Chart Is Useful

The chart which accompanies this article will be found a convenient reference. It indicates the beginning of all curricula, and includes data on all, those which have been abandoned as well as those now in operation. The chart begins with the school year 1869-70, as that was the first year in which distinction was made between mechanical engineering students and civil engineering students. The program of the University as a whole from 1867 to 1869 was dominated by the engineering group. During the first year industrial and mechanical engineering were the chief interests of one-third of the seventy-seven students on the campus. A considerable number of the seventy-seven were in preparatory courses and not in University work proper. The second year of the University brought an enrollment of 128 students. Of this number forty-one were primarily students of engineering.

Comparison of the All Engineering and All University totals shows that at various times the engineers numbered half the total number of students at the University. In 1888-89, for example, the total for the University was 418. Of this number, 201 were in the College of Engineering. In 1891-92, there were 583 students at the University and 302 of them were in the College of Engineering.

Dept. Founding Dates

The dates of beginning for the various curricula as attested by actual student enrollments were as follows: 1868 Old General Curriculum in Engineering; 1870 Mechanical Engineering; 1870 Civil Engineering; 1871 Architecture; 1872 Mining Engineering, 1891 Electrical Engineering; 1894 Municipal and Sanitary Engineering; 1896 Architectural Engineering; 1902 Railway and Railway Electrical Engineering; 1911 Railway Civil Engineering; 1911 Railway Mechanical EAngineering; 1916 Ceramic Engineering (ceramics offered from 1906 to 1916 under other auspices); 1918 new General Curriculum in Engineering; 1925 Gas Engineering; 1927 Ceramics; 1934 Metallurgical Engineering; 1934 Agricultural Engineering; 1935 Petroleum Engineering.

College and University

Year	Eng'ng	All-Uni
1867-68	20	77
1868-69	41	128
1869-70	47	180
1870-71	67	278
1871-72	81	381
1872-73	79	400
1873-74	80	406
1874-75	81	373
1875-76	68	386
1876-77	60	388
1877-78	47	377
1878-79	59	416
1879-80	61	434
1880-81	64	379
1881-82	99	352
1882-83	112	382
1883-84	119	330
1884-85	131	362
1885-86	123	332
1886-87	142	343
1887-88	160	377
1888-89	201	418
1889-90	216	469
1890-91	252	519
1891-92	302	583
1892-93	267	714
1893-94	293	718
1894-95	305	810
1895-96	306	855
1896-97	279	1,059
1897-98	269	1,582
1898-99	285	1,824
1899-00	322	1,225
1900-01	373	2,505
1901-02	464	2,932
1902-03	613	3,289
1903-04	752	3,592
1904-05	855	3,734
1905-06	940	4,091
1906-07	1,077	4,318
1907-08	1,151	4,746
1908-09	1,191	4,979
1909-10	1,184	5,118
1910-11	1,274	5,217
1911-12	1,258	5,300
1912-13	1,155	5,087
1913-14	1,202	5,529
1914-15	1,213	6,004
1915-16	1,216	6,127
1916-17	1,213	6,828
1917-18	918	5,590
1918-19	1,537	7,157
1919-20	1,768	9,249
1920-21	1,661	9,193
1921-22	1,740	10,627
1922-23	1,517	10,869
1923-24	1,461	11,083
1924-25	1,517	12,092
1925-26	1,621	13,399
1926-27	1,685	13,731
1927-28	1,778	14,071
1928-29	1,738	14,183
1929-30	1,800	14,549
1930-31	1,871	14,986
1931-32	1,345	14,569
1932-33	1,119	13,800
1933-34	1,086	12,122
1934-35	1,146	13,067
1935-36	1,172*	14,000*

* Estimate.

Yr. End.	Mech Eng.	Civil Erg.	Architect.	Mining	Elect.	Mun.& San.	Arch. Eng.	Ry. Elect.	Ry. Civil	Ry. Mech.	Cer. Eng.	Eng. Physics	Gen. Eng.	Gas. Eng.	Ceramics	Met. Eng.	Ag. Eng.	Total
1870	46	1																47
1871	39	24	4															67
1872	32	46	4	2														84
1873	24	49	4	2														79
1874	22	49	6	3														80
1875	33	33	15															81
1876	22	31	15															68
1877	24	25	9	2														60
1878	20	18	7	2														47
1879	28	21	4	6														59
1880	25	24	9	3														61
1881	25	30	6	3														64
1882	41	41	14	3														99
1883	39	52	18	3														112
1884	45	51	21	2														119
1885	56	58	16	1														131
1886	53	43	24	3														123
1887	65	45	28	4														142
1888	57	53	46	4														160
1889	74	62	59	6														201
1890	78	71	61	6														216
1891	78	95	73	5														252
1892	88	87	92	6	29													302
1893	53	75	75	6	58													267
1894	48	73	81	2	84	5												293
1895	66	73	73		91	2												305
1896	60	59	69		97	3	17											305
1897	55	66	56		86	3	13											279
1898	47	70	47		89	2	14											269
1899	66	74	42		82	6	15											285
1900	79	99	41		84	5	14											322
1901	105	120	43		88	5	12											373
1902	124	167	40		109	3	19	2										464
1903	182	197	56		137	8	27	6										613
1904	219	232	47		172	8	43	3										752
1905	215	310	42		223	10	31	1										855
1906	233	338	73		254	9	30	3										940
1907	261	400	77		280	5	43	11										1077
1908	256	397	82		311	19	58	28										1151
1909	261	419	90		305	19	67	49										1191
1910	265	421	97		256	18	89	38										1184
1911	271	307	177	19	320	22	106	19	21	12								1274
1912	265	305	189	21	301	25	111	15	17	9								1258
1913	260	216	203	24	279	24	129	5	8	7								1155
1914	276	204	200	42	253	30	164	12	11	10								1202
1915	271	206	179	39	269	36	179	15	13	6								1213
1916	249	193	158	30	267	25	177	17	19	11	69							1216
1917	286	204	149	30	273	28	162	16	14	8	43							1213
1918	229	163	72	18	228	11	133	16	14	8	26							918
1919	524	325	75	21	396	11	100	7	13	3	56	6						1537
1920	528	351	120	61	455	12	156	20	10	6	46	3						1768
1921	473	313	121	66	443	13	140	21	14	11	42	4						1661
1922	431	355	120	89	427	10	130	28	16	9	76	5	44					1740
1923	325	298	110	66	344	15	118	31	19	10	74	10	97					1517
1924	263	256	94	55	374	15	138	31	23	5	88	9	110					1461
1925	244	293	121	39	403	14	153	20	19	9	90	9	102	1				1517
1926	233	292	150	38	471	15	172	21	17	8	89	6	105	4				1621
1927	232	320	182	21	456		209	27	20	9	58	12	101	3	34			1684
1928	269	341	224	15	426		229	24	21	5	60	14	101	3	36			1768
1929	291	326	258	25	411		219	18	17	4	37	11	86		34			1737
1930	334	335	260	19	400		235	26	11	4	37	18	85		36			1800
1931	380	362	259	23	452		185	18	10	6	48	25	98	4	35			1876
1932	356	348	246	18	379		164	18	10	5	52	27	90	1	42			1345
1933	294	277	240	18	329			15	6	3	51	29	88	1	69			1120
1934	254	247	248	17	288			13	4	3	52	28	89		80	6	5	1086
1935	278	243	232	25	280			9	1	3	61	30	74		119	11	10	1146
**1936	283	240	200	28	270			9	3	3	65	31	80		134	14	12	1172

** Estimated totals for year; first semester accounts for 90% of these figures.

An Engineer Writes Home About

SIX WEEKS AT CAMP CUSTER

A Happy Combination of Work and Play

DEAR PAT:

Pulled up at Camp Custer at about ten o'clock on June 15. Lieutenant McDonough and Sargeant Mount were on hand to greet us and to see that we didn't get lost. Learned that Captain Matthews had gone to California and wouldn't be with us. Lieutenant Bingham, who inspected us last year, and Lieutenant Dau were down from Michigan College of Mining and Technology with about twenty more engineers. There were thirty-five of us from Illinois, and with the Michigan Tech group, we were known for the next six weeks as, "Company C, R. O. T. C." Looked across the street and there beheld Herb Frank, Al Reichman, and Johnny Ammerman, standing with far away looks on their faces. Yes, it was the cavalry that we were to have in our front yards. The infantry was directly behind us.

The army didn't waste much time in getting us started. We were immediately put through a really thorough physical exam. By the time the doctors were through with us, it was time to eat. We lined up at twelve o'clock for our first taste of army grub. There we were lined up waiting to get into the mess hall with Levy, Pachaly, and Richardson heading the line. The same positions were carefully guarded by this trio for the entire camp period. That meal and most of the meals that followed were very good. I never could figure out who ate the heartiest that day. Pippin outsat Johnson and Johansen, but I think that the two big Swedes put away the most food.

We drew our equipment that afternoon. It was a pretty ragged looking bunch in their uniforms for the first time. Some of the clothes were too small and some would accommodate two people the size of the wearer. Stoyke and Moore looked very dapper in their two-toned, summer-formal fatigues. Shepherd had to wear "civies" because he couldn't begin to get his breeches on. All that was soon remedied and the engineers looked like a real outfit before long. All equipment had been drawn and the camp was running smoothly before the first day had gone by.

It was nine o'clock before it began to get dark. And just at nine, some one gave the command, "Lights out!" Of course you understand that everything in the army is done by orders. Each night at nine, just as we needed the lights, we were ordered to turn them out. Volle was among the missing when we finally turned in that night. It was discovered the next day, that he had cracked up a car in Elgin, and was unable to get to camp on time.

The mosquitos that first night and most of the nights to follow, were terrible. We had mosquito bars, but even they didn't seem to stop the man-eating Michigan terrors. Namensky claims that he caught two mosquitos holding the mess of the mosquito bar apart while a third insect flew in and did the dirty work. Didn't believe it at first, but one look at McGowan's arm the next morning made me think that something of that sort had really happened to him.

Just as I had gotten to sleep, some joker got on the end of a bugle and started blowing. It was 5:40 a. m. One of the Michigan Tech boys who had been designated Charge of Quarters for that day came into the tent and blew a whistle. He got a shoe in the face when he tried to shake Chuck Royer loose from his cot. Wally Senters awoke with a sore throat and he was sent over to the hospital to have it swabbed out with mercurochrome. That was the last we heard from him for over a week. The hospital force had decided to swab his throat every day for a while. Take my advise and don't go near that hospital with anything less than a broken leg. Once you get inside of the hospital tent, nothing less than a letter from the governor will get you out, cured or uncured.

It rained steadily for the first week of camp. When it rained anything larger than pitchforks and nigger babies, we were allowed to remain in our tents and pass the time as we saw fit. Of course a "Bull session" always fit. It used to fly fast and thick in tent 9 with Christman, Daniels, Volle, Heffington, and LaBaw, reinforced by Jordan, Slaymaker and Reynolds.

When it rained pitchforks or less, we were either doing a turn at close-order drill, erecting barbed wire fences, or dabbling in chemical warfare. I'll never forget the sight of the whole company of engineers, crying like babies after

(Continued on Page 17)

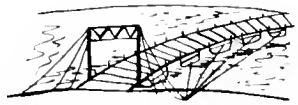
Engineers blowing down a silo at Camp Custer with T. N. T.

R. O. T. C. Engineers testing the effectiveness of a Double Apron Barbed wire obstacle

LITTLE KNOWN FACTS

Whipped Cream By Chemistry

C. A. Getz Graduate Student In U. I. Chem Department Has Devised An Apparatus Which Makes Whipped Cream By Injection Of Chemicals Into The Cream.



110 FT. Of Bridge A Minute

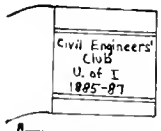
The 1st Engineers, In Which Capt. A. G. Mathews, Unit Head Of The U. I. Engineer R.O.T.C., Was An Officer Built 1 Mile Of Bridge In 48 Minutes, Across The Rhine River In Germany, During The "Occupation Of The Rhine."

R. W. Watson Took His First Year Military In 1902 And His Second Year In 1935. He Is Enrolled In Met. Eng. Class of '37.

"Electricity From Crystals"

When Certain Crystals Such As Quartz And Tourmaline Are Subjected To Pressure A Voltage Is Produced As The Crystal Is Deformed. This Information Was Part Of The Research Carried On By M. W. Woodruff, Graduate Student In E. E., In The Field Of Piezo-Electricity. Radio And Broadcasting Firms Use This Information.

PHB



"The First Technograph"

Started 50 Years Ago With Doctor A. N. TALBOT - U. I. Prof. In Civil Eng. As Advisor.

WEH.

"Precision And Power"

A March
- Dedicated To An Engineer
- Composed by An Engineer
- Was Played by An Engineer

This March Was Dedicated To A. C. Willard - Pres. Of U. I. - An M.E. It Was Composed And Scored By Prof. J. S. Crandell, A. C. E. It Was Played Under The Direction At A Recent Band Concert By Prof. A. A. Harding - An Illinois Graduate In Municipal And Sanitary Engineering.

Fiftieth Anniversary Celebration

The TECHNOGRAPH TAKES A BOW

Files Tell Story

THE FIRST Technograph presented an entirely different appearance from the Technograph of today. It was then an "annual publication" although reports for two years, 1885 to 1887, were bound in the first volume. This two year volume was the size of an ordinary text book. The contents were papers from two to ten pages in length, and nine papers, totaling fifty-four pages were included.

Early volumes of the student publication were entitled, "Selected Papers of the Civil Engineer's Club of the University of Illinois," the name "Technograph" was first used on the 1891-92 collection. The Civil Engineer's Club, then in existence but a short time, published the first "Technograph," setting forth as follows its purpose and the purpose of the publication, on the fly leaf of the volume: "The Civil Engineers Club of the University of Illinois is essentially an undergraduates' society, most of the papers being prepared by students. Not the least important of the results to the members have been the stimulation of independent thought, a development of the ability to hunt up one's own information, and the cultivation of the power to express ideas clearly, concisely and forcibly."

"This publication is made to place in permanent form some of the papers read at the meetings, and also to extend the influence of the society. The intention is to publish a similar volume annually. The committee regrets that the number of illustrations and the length of many of the papers precludes their publication, and also that the valuable discussions of the papers have not been preserved."

The first volume listed all significant papers presented at the meetings of the Civil Engineer's Club from its founding in 1883 to the time of publication of the first volume in 1887. Selections from those early papers constituted the bulk of the content. All of them were by Illinois men, either graduates, under graduates, or teachers. But of one hundred and two papers listed, more than three-quarters were by students. It is interesting to see that this club first met on Saturday afternons and, in later years, on Saturday evenings. It would be almost impossible to have club meetings at those hours with present day campus life.

The titles and authors of the first nine articles published, which comprise the first issue of the "Technograph" will give an idea of the type of material used. "Notes on Topographical Surveying," by C. W. Clark '76, U. S. Assistant Engineer, "Street Pavements" by L. Bush '88, "Details of a City Engineer's Work" by E. I. Cartine '87, "Breakwaters at Chicago" by S. C. Colton '85, Engineer on River and Harbor Work, Chicago, "Hints to Students on the Education of a Engineer" by I. O. Baker, Professor of Civil Engineering, and "Notes on Mountain Railroad Location" by Professor A. N. Talbot, Assistant Professor of Mathematics and Engineering, are the articles published in the first issue.

There were nineteen advertisers in the first Technograph. Besides the usual local school supply stores, A. P. Cunningham and D. H. Lloyde, many manufacturers of machinery and books and instruments advertised. Among them were Minnie and R. L. Jaques—Book and Drafting Instruments; John Dixon Crucible Co.—Graphite Pencils; Missouri Valley Bridge and Iron Works,—Bridges; George F. Blake Manufacturing Co.—Steam Pumps; and many others. A particularly interesting advertisement was one labeled, "The Dean of Holyoke—Steam Pumps for Every Purpose," and was a full page advertisement containing a picture of an old-fashioned steam engine, by the Dean Steam Pump Company of Holyoke, Mass. Another interesting advertisement was by the "Champaign County Gazette" which boasted of being the only daily printed in the county.

In the first four volumes there were no illustrations, except a few graphs. Nothing at all of student activities, interest, or news of the campus, except the technical papers, as read by the students.

Since the first volume of The Technograph was not published until May 1887, it may seem that the year of the founding of the Technograph should be 1887. However, the years given on the cover of the first volume is 1885-6 and 1886-7. Also, the earliest article published was dated, "Read, November 29, 1885." As noted before the Civil Engineers Club was organized in 1883, but it was not until 1885 that any attempt was ever made to preserve the papers read at these meetings. Therefore, the fall term of 1885 is taken as the beginning of The Technograph. It is probable, although not certain, that the separate papers were published for distribution among the members, and then the select few were put into permanently bound volumes.

The president of the Civil Engineer's Club in 1887 was P. A. Goodwin '87. The vice-president was William Barclay '87, and the secretary and treasurer, W. R. Roberts '87. The chairman of the Committee on Publication, was Prof. A. N. Talbot, who is now Professor Emeritus of Civil Engineering. Professor Talbot was the author of many articles in the first few issues, and with the late Professor I. O. Baker was the guiding hand of the first years of The Technograph. Others on the first publication staff were William Barclay '87, L. Bush '88, and E. I. Cartine '87

1890-91. The 1890-91 issue contained an article of twenty-five pages by Professor A. N. Talbot, on "Railway Transition Curves." This article was about the longest published in the Technograph. Another interesting article of this time was, "The Schools of Mechanical and Civil Engineering in the University of Illinois," by Selim H. Peabody, L.L.D., then Regent of the school. In his short article of five pages, Regent Peabody outlines the courses in engineering, as taught in 1890.

No one had the title of editor, in that year, but E. L. Scheidenhelm '92 was business manager, and W. A. Martin '92 was assistant business manager.

1891-92. The 1891-1892 Technograph did not contain the name of an editor or business manager. Some very fine pictures of the equipment the college possessed even in these early days is shown on the first few pages of this volume. The titles of the pictures are "Collection of Civil Engineering Instruments," "View of Corner of Iron-Working Shops," "Electrical Engineering-Partial View in Diagrams Room," and "Senior Architectural Drawing Room." These were accompanied by explanations of them.

1892-93. The 1892-93 issue published a picture of the department heads of that time. They were W. J. Baldwin, of Mining Engineering, Arthur N. Talbot, of Municipal Engineering and Mechanics, S. W. Shattuck, of Mathematics, N. Clifford Ricker, of Architecture, Ira O. Baker, of Civil Engineering, C. W. Scribner, of Mechanical Engineering, and Daniel W. Shea, of Electrical Engineering and Physics.

More views of the college of the time were, "Architectural Wood Shop," "Part of Electrical Laboratory," "Mechanical Shop," and "Engineering Museum" and "Part of Mining Laboratory."

The editor and business manager of 1892-93 was not published, except that The Technograph was published by the Engineering Societies of the University.

1893-94. The 1893-1894 issue had a "Board of Publication" composed of members of the Civil Engineers, the mechanical and electrical engineers, and the architects. The business managers were, J. C. Quade '95, P. Junkerfield '95, and A. W. Bush '94.

The 1893-94 isue was unique in that it was divided up into three departments, the Civil, the Mechanical and Electrical, and the Architects.

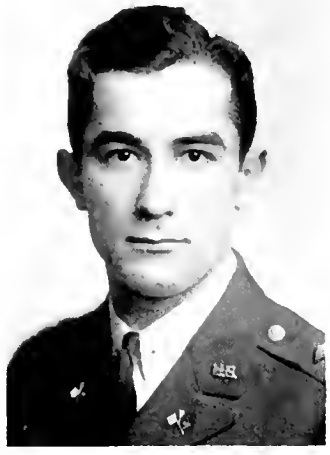
1894-95. The 1894-1895 issue was larger than the usual Technograph. It was 182 pages, against the usual 100 pages of years before and 146 pages of 1893-94.

There was no editor or business manager in 1894-95. An interesting article is the description of "The College of Engineering" by W. R. Morrison '95 and P. Junkersfeld '95, as the college was in those days. Floor plans of Engineering Hall in 1895 as shown in the article would never be recognized by the student of today.

(To Be Continued)

• WHO'S WHO IN ILL

• *D. K. Harris*



• *J. C. Skorcz*

• *F. C. Bennett*

DAVID K. HARRIS is due for a very busy year. If past performances are any indication of future achievement he should have no trouble keeping up his grades. The M. E.'s have elected Dave to direct the affairs of both Pi Tau Sigma and the A. S. M. E. in the roll of president.

Dave missed Phi Eta Sigma by .01 in his freshman year. Excellent grades throughout his sophomore year and a five point in the first semester of his junior year convinced Tau Beta Pi that Dave possessed the scholastic prowess that it demands of its members. Ten minutes with Dave will convince anyone that he has as fine a character and personality as can be demanded by any organization. Dave's outward evidence of membership in Triangle fraternity, where he is Vice-President and pledge master, is being worn by a sweet young thing back home in Rochester, New York.

JAMES C. SKORCZ finds time for his school work and for extra curricular activities even though he is working his way through school. He has ambitions of becoming a great electrical engineer. He has a great start as handy man and electrician at the Sigma Delta Tau house. Ever since his freshman year Jim has been utilizing his good eye and straight shooting qualities on some rifle team. He captained the Freshman pistol team, the Scabbard and Blade rifle team and the independent rifle team that won first in intramural competition. Jim is a member Scabbard and Blade, Vice-President of Pi Tau Pi Sigma and was the Signal Corp's Lieutenant Colonel last year. He served on the committees of the Senior Ball and the Military Ball. You'll probably see Jim working as Chief Clerk in 319 E. H. during registration. As a salesman, he is unexcelled.

FOSTER C. BENNETT is one of the few engineers who find time to lay down their slide rules long enough to earn a letter in a varsity sport. Foss was a football star at New Trier High School and he went out for football in his freshman year here, but his proficiency in the swimming tank centered his interest on water polo. Numerals in his freshman year were followed by a letter in his sophomore year for performing the duties of varsity goalie. He earned another letter in the same sport last year. A third letter will be his at the end of this school year in which he will captain the water polo team. Foss is a Dolphin and a member of the Tribe of Illini. His scholastic average in Engineering Physics is about four point. He is president of Sigma Chi Fraternity and center on their intramural basketball team.

Clifford Graham, M.E. '36 is a transfer from Bradley College at Peoria, Illinois. Due to his persistent efforts last year Cliff became a member of Pi Tau Sigma, honorary M.E. organization. He can be found any night at the A.T.O. house if he is not over at the Gamma Phi hotel whispering sweet nothings to his girl. She has Cliff's pin and is from his home town. Cliff expects to attain higher scholastic honors this next year and also to branch out into activities.

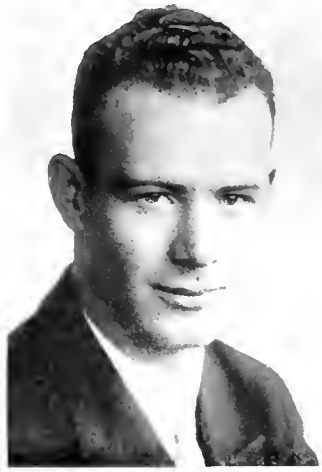
Dale D. Streid is a mechanical engineer in the class of '36. By his own efforts he was taken into Tau Beta Pi during the second semester of his junior year. Dale worked on the Technograph in his Sophomore year as advertising manager. He is a member of A.S.M.E. and when not engaged in school work he is busy at the Treasurer and Commissary jobs at the A.K.L. fraternity. Dale is also watching out for the more lighter side of life as he is very often seen with a prominent Professor's daughter. Just another Chenoa, Illinois boy making good.

W. O. Wigginton C.E. is one of those engineers who turned politician. He did a good job of representing us in the Student Senate last year. Aside from his political activities, Wes is a soldier of note. He claims membership in Pershing Rifles, Tau Nu Tau and the military honorary Scabbard and Blade. His engineering activities are confined to being a member of the A.S.C.E. When desirous of food or rest, he drops in at the Chi Phi house. If you can't locate him at the Chi Phi house, you will find him at Hanley's with his "little cookie." As yet, no sleuth has been able to uncover his place of study.

Out to show everyone that a good freshman can't be kept down, Jack Robinson, C.E., made a name for himself which stands along with the best. Breaking records seemed to be Jack's pastime when he worked out on the track. He was a first class high hurdler and gave a fine exhibition of fast movement. Studies did not suffer from his work of slinging hash at Newman Hall and running around the armory because he is a four-point student. As a final honor to him, Jack was elected to Tomahawk honorary last spring for his excellent showing during the year.

Lyman Moore hails all the way from

NGINEERING WORLD •



A. E. Bitter •

R. A. Newcomb, Jr. •

E. A. Post •

EDGAR A. POST might have become a great physicist some day if he had accepted a physics scholarship from the University of Chicago. Instead he chose to become one of the outstanding students of the E. E. Department at the University of Illinois. Ed started off with a bang and made Phi Eta Sigma in his first semester. His junior year still found him knocking down enough excellent grades to become a member of Tau Beta Pi. The duties of Vice-President of Eta Kappa Nu and Treasurer of Pi Tau Pi Sigma are Ed's to carry out this semester. Think of him when you hear or dance broadcasts over WILL for he is the one who is responsible for the hook-ups that get the programs to the WILL transmitter. His spare time is spent comparing reception with other "hams" over his own radio station, W.9ISV, which he has had in his room for two years.

REXFORD A. NEWCOMB, Jr., has so many claims to prominence in the College of Engineering that it will only be possible to list a few of them here. He is President of the Student Branch of the A. C. S. and a member of the Engineering Council, Arepo, Caisson Club, Scabbard and Blade, Pierrot, Tomahawk, the Union Board of Directors, Mu Pi Sigma, and Vice-President of the Independent Council. Rex served on committees for the Senior Ball, St. Pats Ball, Mi Hila, Engineering Open House, and Homecoming. He has starred in the casts of Hit the Deck, Gold in the Hills and has worked on the production staff of many of the other campus plays.

His summer was divided between selling advertising for the Technograph and working in a canning factory. A local doctor's daughter is claiming the amourous attentions of Rex and she surely can feel confident that Rex will some day reach the top of the ladder.

ALBERT E. BITTER has gained for himself an enviable reputation as a scholar and leader since he came to Illinois a year ago. His first two years of University life were spent at Illinois College in Jacksonville. There, he was president of his freshman class, a member of Phi Alpha, social fraternity, a member the Illinois College Dramatics Club and the varsity tennis team. F. E. R. A. work in Dean Jordan's office didn't seem to cramp his ability to make grades. Al was one of the few engineers to receive College Honors last year. Tau Beta Pi and Chi Epsilon were quick to recognize his scholastic ability and they took him into their respective organizations. Al is vice-president of the Tau Bates. On top of it all, he was elected president of the A. S. C. E. and now he is busily engaged in getting that organization off to a good start.

Rhode Island to study ceramic engineering at the University of Illinois. He is a member of the Student Branch of the American Ceramic Society and a member of Tau Nu Tau. Lyman spent part of the summer at Camp Custer and the last half at his home in Rhode Island. You can see him at most any dance on the campus with Marjorie Voight, our girl ceramic engineer. He likes to dance and is really good at it.

--Tom Johansen, six foot three mechanical engineer has made a great name for himself through his work in the military department. He was selected as the best junior Advanced Course soldier last year and as such, received a saber from the Women's Auxilliary of The American Legion on Military day. He is vice-president of Tau Nu Tau, honorary Engineer Corps fraternity, and a member of Pershing Rifles. During the summer, Tom works as a life guard on the beach at Willmette.

Wilford Burdick, Bosco to you, is a C. E. that only has 20 hours to get in before he goes out to conquer the world. Bosco put in most of the summer gaining valuable experience as Engineers Assistant on the Springfield Avenue paving job. Before he got that job, he was a C. M. T. C. instructor at Jefferson Barricks in St. Louis. Bosco is a 2nd Lieutenant in the R. O. T. C. and a member of the A. S. C. E. His home is in Rockford but most of his spare time is spent with the girl friend in Champaign.

Olin Schneider, a senior in Mechanical Engineering, plans to finish his college education this year. Ollie has worked for the Levitt Manufacturing Company of Urbana this summer. He is a member of Phi Kappa Sigma, A. S. M. E. and was a First Lieutenant in the R. O. T. C. At the last St. Pat's Ball, Ollie was chosen from a group of six candidates as Saint Pat. He possesses a keen sense of humor and has made many friends on the campus. When he is not burning his study lamp Ollie can be found at Kammerer's on Lincoln Avenue handling the cash register.

Milo S. Ketchum left the Reclamation service and went into the Portland Cement Association in the structural division.

S.P.E.E. Meets at Atlanta, Georgia

Twenty-one members of the College of Engineering faculty attended the 43rd Annual Meeting of the Society for the Promotion of Engineering Education at the Georgia School of Technology in Atlanta on June 24-27, 1935.

Several of the Illinois men spoke at the various technical meetings. The following are those who attended:

Prof. H. E. Babbitt, Prof. E. E. Bauer, Prof. C. H. Casberg, Prof. J. O. Draffin, Dean M. L. Enger, Prof. N. E. Ensign, Prof. C. W. Ham, Prof. R. P. Hoelscher, Dean H. H. Jordan, Mr. A. Jorgansen, Prof. E. E. King, Prof. A. R. Knight, Mr. W. M. Lansford, Prof. O. A. Leutwiler, Mr. N. M. Newmark, Prof. F. M. Porter, Prof. F. B. Seely, Prof. W. H. Severns, Prof. F. W. Stubbs, Jr., Dr. A. N. Talbot, and Mr. F. H. Thomas.

The 11th Annual Meeting will be held next summer at the University of Wisconsin in Madison, Wisconsin.

A. B. Wilder and C. R. Fink to Teach Here

Two new men have accepted positions on the faculty of the College of Engineering. Mr. C. R. Fink will be an instructor in General Engineering Drawing. Mr. Fink graduated from the University of Illinois in 1932 with a B.S. degree in Architectural Engineering. While he attended school here he was active in the affairs of Tau Beta Pi, Gargoyle, and Sigma Tau. He has been employed as structural engineer in the office of Vonnegut, Bohn and Mueller, architects of Indianapolis, since May 1934.

A. B. Wilder starts here as Assistant Professor of Metallurgical Engineering. Professor Wilder received his B.S. at Mount Union College in 1925. This was followed by an M.A. from Ohio State University in 1928 and a D.S. degree from Harvard in 1933. Professor Wilder is a member of Sigma Xi. He was an instructor at the Case School of Applied Science for one year and an assistant at Harvard University for two years. Since 1933 he has worked as research metallurgist at the American Steel and Wire Company in Cleveland, Ohio.

Large Ceramic Enrollment

The Ceramic Department has been remodeling some of its laboratories to enable them to take care of the large increase in students in the past few years. Partitions are being torn out of some of the adjoining laboratories to make one large lab with locker facilities.

The enrollment in Ceramics and Ceramic Engineering has been steadily increasing for the last three years. One Ceramic Scholarship is given by each County in Illinois each year. Prof. C. W. Parmalee, head of the Ceramics Department, reports that all of last year's graduates were promptly placed in the Ceramic industry. W. W. Coffeen, Business Mgr. of the Technograph last year and a graduate in Ceramic Engineering, is doing research work here this fall for a large enameling concern.

New Bulletins by Experiment Station

The Engineering experiment station has just recently issued the following bulletins.

Bulletin No. 274—"A Supplementary Study of the Locomotive Front End by Means of Tests on a Front-End Model," by E. G. Young.

Bulletin No. 275—"Effect of Time Yield in Concrete upon Deformation Stresses in a Reinforced Concrete Arch Bridge," by W. M. Wilson and R. W. Kluge.

Bulletin No. 276—"Stress Concentration at Fillets, Holes, and Keyways as Found by the Plaster-Model Method," by F. B. Seely and T. J. Dolan.

Bulletin No. 277—"The Strength of Monolithic Concrete Walls," by F. E. Richart and N. M. Newmark.

Until February 1, 1936 or until the supply available for free distribution is exhausted, copies of these bulletins may be obtained without charge upon application to Engineering Experiment Station, Urbana, Illinois.

Tau Beta Pi Nominates Faculty Men

Professors, A. C. Callen, H. H. Jordan and W. N. Espy have been nominated by the University of Illinois Chapter of Tau Beta Pi, national honorary scholastic fraternity, for positions on the Tau Beta Pi national executive council. The three men have actively promoted the interests of the local Chapter for the past several years. Slates have also been submitted by Armour Institute of Technology, University of Kansas, University of Maryland, Michigan State College, Michigan College of Mining and Technology, Columbia University, and the University of Tennessee. The election will take place at the Semi-Centennial Convention to be held on the Campus of Michigan State College at Lansing, Michigan on October 10, 11 and 12. The new Council will take office a year after election and will serve for three years.

Faculty Changes Announced

The College of Engineering announces the following changes in its faculty:

Ceramic Engineering

W. R. Morgan from Assistant, ½ time, to Instructor.

W. B. McDevitt from Assistant Laboratory Demonstrator to Laboratory Demonstrator.

A. E. Badger from Research Assistant to Research Associate.

Electrical Engineering

W. J. Warren from Assistant, ½ time, to Instructor.

General Engineering Drawing

L. D. Walker from Instructor to Associate.

G. R. Fink, Instructor (new position)

Mechanical Engineering

J. A. Goff from Associate Professor to Professor of Thermodynamics.

D. G. Ryan from Associate to Assistant Professor.

Mining and Metallurgical Engineering

A. B. Wilder, Assistant Professor of Metallurgical Engineering (new Position).

Physics

G. M. Almy from Associate to Assistant Professor.

Theoretical and Applied Mechanics

J. O. Draffin from Associate Professor to Professor.

University Gets New Water System

The new one half million gallon storage tank just south of the University golf links, operating with the two new wells which have been recently drilled at Illinois Field, will provide the University of Illinois with one of the most efficient and economical water systems in the state, according to W. D. Gerber, engineer of the State Water Survey.

The tank was built at one of the highest points on the south farms to permit shutting off the pumps at night. The pressure created by the height of the tank will be sufficient to operate the water system at night except when an emergency, such as a fire, necessitates extra pressure. Then the two pumps will be used.

The two new wells are to be pumped at the rate of 600 gallons per minute, although tests have shown that they will pump 2,500 and 1,000 gallons per minute. However, according to Mr. Gerber, continuous pumping at such high rates would cause clogging of the water bearing sands and gravels.

Two New Paving Projects

The paving of Gregory Drive from the broadwalk, where the old black top ended, to Goodwin Street has been undertaken by the University of Illinois. The design for the concrete roadway was made by members of the physical plant. Prof. C. C. Wiley of the highway department acted in the capacity of adviser. The General Paving Company of Champaign, headed by Paul Kent, a graduate in civil engineering of the College of Engineering, has the contract for the work.

Two other changes in the city's traffic situation may have been noticed. The University has installed traffic lights on the corner of Wright and Green and on the corner of Mathews and Green. The other change has been the paving of Springfield Ave., from First to Wright St. When the route is opened, it will carry U. S. 15, U. S. 150 and Ill 10 through Champaign to Wright St., on which they will go to University and on University through Urbana.

THE RIGHT ANGLE . . .

50 Years

The Illinois Technograph with this issue celebrates its fiftieth anniversary as the student magazine of the College of Engineering of the University of Illinois. Its record is a long and distinguished one in which it has observed the styles and fashions of the day in its content and manner of presentation, and in which some of the most notable students and faculty members have been regular contributors and editors.

Not only has it been widely known among the college folk of the times throughout its existence, it has also enjoyed a reputation among practicing engineers and has passed through periods when it was a magazine on which the profession depended to keep in touch with the best thought and most recent advances in the world of science and engineering. Long before the high grade professional magazines of today were developed The Technograph had its own following out in the business world. It was quoted by distinguished speakers at conventions, its reports were copied by writers of textbooks and manuals on engineering, faculty men and engineers in all parts of the country considered it an honor to be invited to contribute to its pages.

The development of distinguished journals staffed by experienced editor-engineers and supported by national advertisers, societies with large memberships and individual engineers with highly specialized interests led to changes in the policy and fields of usefulness of The Technograph and it came by easy stages to the exclusive service of the students and faculty at its own institution.

For a time it sought to make a place for itself on the campus as a purveyor of technical and educational matter, but the success with which general engineering magazines dealt with these materials made the efforts of The Technograph unsatisfactory. The "high brow" type of material was definitely abandoned in 1933 and the present policy inaugurated of presenting a magazine dedicated to service of the student body in other ways than as a supplement to class exercises.

But the story of The Technograph cannot be managed in a brief recital. It is a story of fifty years of activity, of fifty editors, fifty managers, fifty faculty advisers and a host of student contributors. It is the story of the College itself during the past fifty years.

Get Together

One great advantage of a small school is that each student knows every other student in the college. It may not seem to be an important advantage, but if you have ever attended a small school the advantage will be obvious to you. The time honored saying, "In union there is strength," applies very well in this case. A closely united group is able to accomplish many more worthwhile things and is able to have much more fun accomplishing them than is a group of "strangers."

The University of Illinois is by no means small. It would be impossible for each student to know every other student in the University. Perhaps even the College of Engineering is too large for such a set-up. However an effort should be made by each student to meet as many of his fellow engineers as he can.

There are several ways open to the student who wants to broaden his acquaintanceships. Probably the best way is to join a departmental society such as the A. S. C. E., A. S. M. E., or the A. I. E. E. In that way you get the double benefit of broader contacts and the valuable scientific training afforded by attendance at the meetings of such a society.

While you are meeting people, don't forget the faculty. You will undoubtedly find even the strictest professor to be very friendly and very glad to make your acquaintance. You will find them very human.

Attend all of the social functions of the College of Engineering and those of your particular department. They all broaden one's education and help to mold our College into one large friendly group.

The Honor System

The graduating engineer must have a thorough technical knowledge, an unquestionable character, and executive ability. Here at Illinois, we receive a thorough technical knowledge under the best of faculties and equipment, and executive ability through the many organizations on the campus, but nowhere on the campus is there any special consideration given to character training. Why then, don't we make our education as complete as possible by adopting the Honor System—the best of character builders. The Honor System teaches the essentials of good character by encouraging honesty and self-restraint.

Under the present outmoded Proctor System of giving examinations, the basic assumption is that the student is untrustworthy. Is it any wonder, then, that the students take advantage of this assumption? Many skillful ruses are originated by the ingenious students. Unfortunately they work all too often. Examinations become contests in which the students on one side attempt to outwit the enemy, the proctor. Should the student's methods be so crude that he is caught, he has the sympathy of his classmates, for after all aren't they on his side in this game?

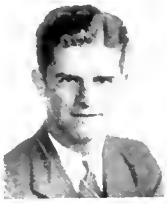
Under the Honor System, an air of confidence prevails throughout the examination room. No longer is there a game to be played between instructor and student. The instructor trusts the students. The students trust each other. If you forget yourself and cheat, even though your classmates do not catch you at it, your ever present conscience will find you out and make you feel like the chump that you are for taking advantage of the Honor System. Should you be caught cheating, instead of receiving the sympathy of your classmates you receive only their antipathetic glances which speak volumes. One's good name is certainly more precious than anything that can be gained by cheating.

If the Honor System is adopted, the graduates will carry away with him more than a knowledge of thermodynamics, calculus, and structural stresses. He will have a character built up and strengthened by four years of honor. What more could anyone ask of college?

(Faculty! Students! We invite your opinion on this important subject.)

Obituary

The many friends of Frank McArthur Morrow were plunged into grief when they learned that he had been killed in an automobile accident on July 22. He was enroute to work from his home in Genesco when his automobile left the road on an overhead crossing at Lynn Center. It is believed that the accident was due to a faulty steering gear or unequal locking of the brakes.



Frank made a marvelous record in his work here. He was recording secretary of Tau Beta Pi, President of Chi Epsilon, and secretary of Tau Nu Tau. He was a captain in the R.O.T.C. Engineering Corps here and later, a second lieutenant in the O.R.C. He was a member of Triangle fraternity and had just been awarded membership in Sigma Xi, national scientific fraternity.

Upon receiving a B.S. degree in Civil Engineering last June, Frank was offered a fellowship at Harvard University. He declined this to take up a position of construction engineer on a government project in Keithsburg.

* * *

Robert Schere, who graduated as a mining engineer from here in 1931, was killed in air maneuvers of the regular army on August 21.

New Courses in Petroleum Production

Two new courses will be offered by the Department of Mechanical Engineering this year to seniors in mechanical engineering and others who are qualified. They will be listed in the catalog and time table as M. E. 35, and M. E. 36, both Petroleum Production Engineering. M. E. 36 is given in the second semester and is a continuation of M. E. 35.

These courses are part of a Petroleum Production Option for mechanical engineers offered with the co-operation of the Department of Geology and Geography. The Petroleum Production Engineering courses appear in the fourth year and will be offered this year as technical options for students interested and prepared to take them. As given this year they will begin with a brief survey of petroleum geology as a preparation for the main content which is engineering. Primarily they will deal with the engineering problems encountered in the petroleum and natural gas producing industry which has been employing a considerable number of engineers, and will probably need more high grade engineering talent in the future.

The day of crude and wasteful production methods is rapidly passing, the larger companies having already built up engineering staffs in their efforts to produce oil from their properties in such a way that maximum possible recovery is obtained in addition to economy. This is a comparatively new field for the engineer and one in which there are many knotty problems yet unsolved. A vast industry which manufactures machinery, supplies, and equipment used in producing oil and gas has also grown up. There are numerous problems which may be solved only by the practical application of new ideas in the design of equipment and in production methods.

While the industry owes its initial growth to the so-called practical man, it has of late been recruiting its technical personnel from the engineering colleges. It has been the custom with the larger companies to give their young engineers a limited experience as general "roustabouts" in the field. The oil producing properties are often some distance from large towns, and in sparsely settled sections of the country; however, the work and environment should be quite healthful and body building. Field experience will be of great value as the young engineer gains judgment and can take responsibility, and also to the engineer who later wishes to enter the more technical divisions or the manufacturing industry.

For a more complete description of the petroleum producing industry and the part played by the petroleum production engineer, the student is referred to an article by Professor W. V. Howard in the April 1933 issue of The Technograph. The sophomore or junior engineering student who is interested should arrange to take Geology 43 and Geology 2 during the year. Seniors who wish to elect Petroleum Production Engineering as a technical option or elective this year, may learn more about the details of courses M. E. 35 and 36 by conferring with Mr. R. F. Larson, 105 Mechanical Engineering Laboratory.

The petroleum production curricula offered at other institutions have been, in general, very successful and popular and very little difficulty has been experienced in finding positions for the graduates in the past. It is expected that a number of engineering students at Illinois will avail themselves of these new courses, to fit them for employment in this important industry.

Triangle Repeats First Place Scholarship

Triangle, all engineering social fraternity, winer of first place scholastic ranking for the first semester of 1934-35, held this rank for the second semester as well, according to the tabulation prepared under the supervision of C. R. Frederick, assistant dean of men. The AKL's with an average of 3.8349 were in second place, .0974 points behind the leads mark of 3.9323. Beta Theta Pi, consistently in the upper four places, was in third place with 3.6344. The all-University men's average was 3.2603, the all-fraternity average was 3.1846, while the non-fraternity men's average was 3.3057.

Summer Snapshots —

Tom Scholes had a great summer working as a cable spinner on the San Francisco-Oakland Bay Bridge. His transportation to California was taken care of when he got a job driving new Studebakers out to the Coast. Tom worked on top of tower No. 3 seeing that each new wire was adjusted properly.

Ray Kempf, W9DKF, is an old timer in amateur radio circles having some fine "DX" contacts to his credit. He constructed and installed the public address system in use at Bradley Polytechnic Institute, his Alma Mater, even down to the condenser microphone. He has intellectual ability coupled with manual skill and should make a name for himself during his last year.

Another E.E. transfer is Herb Ms-Skinner, W9DPD. Herb has been with the control station of the third district of the Illinois Army Amateur Radio System, and will certainly be missed this fall. He has been a constant 5 point student at Bradley during the past two years and is as fine a fellow as can be found anywhere.

Unable to find jobs, the Jeppesen twins, C.E. '36, spent the summer watching the completion of the Ruby Street Bridge in Joliet, engineered by their father. In his spare time between tennis matches, N. L. made plans for Theta Tau while G. L. spent his time in straightening out the Tau Beta Pi files and contacting speakers for the A.S.C.E.

R. W. Cline, Harold Bigger, and Herb Sprengel completed a trio of Synton brothers who complained of the heat at Summer School for eight weeks. They claim that there was only one place deader than Prehn's and J. C.'s and that was Engineering Hall. The silence was deafening. A general air of serenity pervaded the entire campus, attributable, no doubt, to the scarcity of engineers.

Don Taylor worked for the last half of his vacation on the bridge gang of a railroad in Springfield. Don had to loaf until August 1st, but they couldn't hold a good man down all summer. He spent some of his time straightening out the accounts of Triangle and Tau Beta Pi.

H. E. Cocke has been occupied with various and sundry duties this past summer. Most of his time was taken up working for a contractor, doing nearly every kind of job except that of boss. A short canoe trip just before the beginning of school helped to make the summer more of a vacation.

Sherman Taylor spent most of the summer at Phelps, Wisconsin, and aside from repairing tires and installing sinks in the Taylor cottage, was entirely divorced from engineering activities unless swimming in near-by Long Lake qualifies hydraulically.

R. C. Purl has been developing his physique at the expense of the Pullman Company at the Mechanics Shop in Chicago. His work was that of repairing the shafts which are used to transmit power from the car axles to the air-conditioning equipment of Pullman cars. Ray says that the work was very interesting as the equipment was still in the experimental stage and presented many tough problems.

Harvey Fraser decided that he liked army life better than engineering. He received an appointment to the United States Military Academy at West Point and he has already departed for that school. Harvey was active in freshman track and football last year. He was a member of Pershing Rifles and was honored by Phalanx for being the best infantry freshman. In addition to winning these honors, Harvey found time to put his grades up to the standard of Phi Eta Sigma. West Point gains and we lose.

Don Bassett was fortunate to get a job of an engineering nature, even though it was an E.E.'s work and Don is a C.E. He worked for the university electricians on all sorts of repair and maintenance work. Don helped to install the four new stop and go lights on the campus.

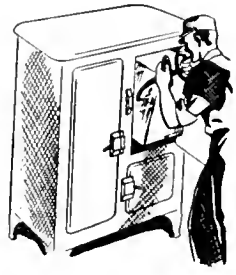
Wendell Ramsey and Harry Skinner spent the summer plowing corn and making hay in the vicinity of Aledo. Even if farm work isn't very profitable, the rumor is that they worked up lots of muscle to use on their slide rules this fall.

Some of the other fellows that were lucky enough to find summer employment are T. F. Pope, teaching school in Urbana, W. C. Bowers, filing blueprints and welding in the International Harvester Works in Moline, J. C. Raleigh, lifeguard somewhere, Tom Johanson, six weeks at Camp Custer and then lifeguard at Wilmette.

Don Heintzman got some practical experience in chemistry this summer. He sold beer. He says that it is very interesting to watch the reactions.

We ran across Joe Kreek diving in the radio stores on South State Street in Chicago. We accused him of spending his pennies on parts for his "Ham" transmitter, W9TNH, but he assured us that the parts were for the neighbors radios on which he was working.

Weston Hester, the ceramic socialite, has been developing his physique shifting 300-pound ice cakes this summer at the Peoria Service Ice Company—just the type of training to get into condition for the fall dances. According to Wes, the company intensively trains its employes on the importance of their product. Recently when asked what hard water was, Wes subconsciously replied, "Ice."



A. E. Bitter spent the summer drafting and designing in a government office. His week-ends are spent visiting a brunette in Urbana. It is this same brunette that worked with Al for Professor Jordan on F.E.R.A. work last year. We have heard from a reliable source that all they did towards the last of the semester was to sit and look at each other.

Six Weeks at Camp Custer

(Continued from Page 8)

they had emerged from a two minute stay in a tear gas chamber and had removed their masks. The masks were all right, but the gas from their clothing had drifted up to their eyes after the masks had been removed. Duncan and Wilcox got a real dose a little later when, as they were listening to a lecturer explain about the use of tear gas in stopping strikers, he set off a tear gas grenade at their feet.

When Saturday night rolled around, Company 'I' shifted its battle field to the Rendezvous on the shores of Goguac Lake. You could find Black, Kunzer, Gano, and Smittkamp there on almost any night of the week. Johnny Brinkerhoff used to chauffeur them out to the Rendezvous and then he would disappear until it was time to pick up his tent mates again in the wee hours of the morning. Never could figure out where he went. Moore wasn't very far behind Brinkerhoff's charge. Carry Pruitt used to make a fortune acting as the official engineer's taxicab to and from Battle Creek with his big Graham. Fritz Heinig made quite a commotion one early morning when he came home from the Rendezvous and found that his dear tent mates, Hyndman, Johansen, Johnson, and Wigginton had laced up the tent flaps so that he couldn't get in.

By the fourth week, Levy had grown a luxuriant crop of hair under his nose. Bob Shepherd had done the same thing, but after taking a picture of it, he shaved it off for a date with a major's daughter. The boys got jealous of Levy's beautiful mustache and so they decided to trim it. Farley held him while Sam Daniels performed the operation with a straight razor. About half way through, they got soft hearted and let him go. Levy finished the job himself.

Of course we didn't play all the time. We would leave the company street each morning at seven to learn something new and interesting about the duties of an engineer soldier. While we were gone, a major from headquarters would make the rounds of all of the tents to see what he could find wrong with them. The engineer tents were always far above the cavalry and infantry tents in his reports. We were so good that he had to pick on the most minute details to find anything to report. George Staudt got called one morning for not having the soles of his shoes shined.

As time went on, we learned to lay out trenches, and machine gun pits, how to stage an attack, build bridges, use T. N. T., ride and care for horses, and last but not least, to shoot rifle and pistol. Shepherd and Johnson were so expert in the firing range that they went to Camp Perry with the Sixth Corps Area R. O. T. C. rifle team during the first part of September. We finished off our six weeks' work with an all night hike and an attack on an imaginary enemy at 1:00 a. m. the next morning.

We really hated to see the end of our camp life draw near. It was an experience that we will probably never have again. We learned a world of things and at the same time, had one swell time learning.

—BILL.

The Engineering Council

The Engineering Council is an organization composed of the presidents of the various engineering societies. It was founded in 1919 through the efforts of Dean C. R. Richards.

In the past the Council has been quite active and was of considerable value in sponsoring dances, smokers, etc. Last year the Council started the year in fine style by promoting a very successful All-Engineering Smoker. This get-together had Pres. Willard, Dean Enger, Prof. Knight, and Capt. Matthews as speakers.

The Council was responsible for the much talked about and interesting "Open House" held on April 13th of last year. Many favorable comments were made in regard to the Council's control of this activity.

The biggest social event in the Engineering College, the St. Pat's Ball, is one of the high lights of the year. Last year's Council is to be congratulated for its united efforts in bringing the attention of the entire University to this Engineering affair.

M. T. L. Is Center of Research

An interesting report of the current investigations that are being carried out by the College of Engineering Experiment Station, appeared in the June 6, 1935 issue of the Engineering News Record. The report was written by Dean M. L. Enger. Some interesting facts concerning the Materials Testing Laboratory were brought out in the article. The building was built in 1929 to provide facilities for research in structural, highway, and sanitary engineering, fatigue of metals, hydraulics, metalography, timber, reinforced concrete and other building materials.

By far the most spectacular piece of equipment in the laboratory is the huge, 3,000,000 pound testing machine that looms almost fifty feet high in the large crane bay. This machine, operated hydraulically, and served by an electric elevator, can accomodate specimens up to thirty-eight feet in length, in either tension or compression. Two smaller machines, one of 800,000 pounds capacity, and another of 300,000 pounds capacity, handle the smaller work. The large machine was the center of attraction at the Engineering Open House last year when several concrete cylinders, twenty inches in diameter, were crushed.

The basement and first floor of the west end of the building houses, one of the best equipped hydraulic laboratories in the country. The basement contains about 350 feet of open hydraulic channel in which various tests can be run and from which the water for hydraulic experiments is drawn. A 65 foot standpipe maintains constant heads for the work.

Directly above the hydraulic laboratory is the Mechanics lab. Here the students learn the properties of metals by observing their behavior when subjected to shears, flexures, or direct stresses. The well equipped laboratory occupies the two wings on the west end of the building.

On the third floor, in the west end, is the fatigue of metals laboratory. The College of Engineering has been actively engaged in the study of the fatigue of metals under repeated stress, for the last fifteen years. During this time, a half a dozen different types of machines have been developed for testing small specimens. Some of them have a maximum speed as high as 30,000 cycles of stress per minute.

The concrete laboratory in the basement of the east end of the building,

F. E. RICHART

and the bituminous laboratory on the third floor are two more places of interest. Here the students learn the various laboratory tests that are performed on cements, sands, stones, bituminous materials, etc. Cast iron pipe investigations and rails investigations occupy the east end of the third floor. The first floor is partly taken by a sewage lab, and the second floor is partly taken by soils mechanics labs. There are several classrooms throughout the building.

For the last four years, Professor Wilson of the Civil Engineering Department has been testing reinforced concrete arches in the crane bay. The last of the arches was removed this spring, and in its place has been built the first of a series of rigid frame bridges. They are of a type that are commonly used on modern highway construction. They will be tested in much the same way as were the concrete arches. The bridges have been built so that introduction of known rotation, settlement or lateral movement of either leg is possible. The effect of such movements upon moments and stresses throughout the structure will be studied. The tests, undertaken with the co-operation of the Portland Cement Association, are under the direction of Professor Wilson.

In connection with the above tests, several types of reinforced concrete knee bends are being tested. The separate test enables the knees to be investigated much more thoroughly than they could as part of the rigid frame bridge.

Tests have recently been completed on more than 100 eccentrically loaded columns to furnish information that is needed by designers. The formulas in use now are emperical and it is expected that the results of these tests will lead to more sound formulas. Aside from a few tests made in Germany in 1913 and some made in our laboratories in 1916 and 1925, the present tests are the only ones of their kind that have been undertaken. The work is being carried out by Professor Richart and Mr. T. A. Olson.

Engineering Superstitions

Influence Exerted Through Ages

MODERN superstitions related to engineering play an important part in construction and building activity today. Among the most widely observed are the superstitions concerning Friday—contractors will not begin building operations on that day, railroads report the least travel on Friday, and there are other evidences of an attitude on the subject that engineers must take into consideration. Thirteen is a number that is taboo with engineers due to the attitude of the public hotels and apartments skip from twelve to fourteen in numbering floors and generally make Room 13 a parlor instead of a guest room. Women are not permitted in tunnels under construction and spanning the distance from earth to air, when the highest point of a building has been reached superstition divests that a flagpole be erected at once. Steps are still constructed in odd numbers; alters in many new churches permit worshippers to face toward the East; work on a bridge job is still considered by construction gangs unsafe until someone has been killed.

Influence of Ancient Days

These modern superstitions give us some sense of the feeling induced by the superstitions of more ancient days. For many people, stories of olden times embodied matters of the most profound belief and exerted influences in engineering and elsewhere. But to us the strange traditions and superstitions of other days and other lands read like a "believe it or not" column.

Same Old Superstitions

For centuries superstition decreed in Ireland that human blood be mixed with mortar, or human sacrifice of some sort be made, to insure the permanance of the buildings. Quoting from Chamber's Journal, 1883, "When Saint Colomba attempted to build on Iona, the walls by power of some evil spirit fell down as fast as they were erected. The Saint received supernatural information that when a human victim was buried alive, then only would the walls stand. The lot fell on Oran, companion of the Saint. He was buried alive and after three days Saint Colomba went to uncover Oran. Oran lifted his eyes and said, "There is no wonder in death, and hell is not as reported." The Saint was so shocked at such impiety that he ordered the earth thrown in immediately as he uttered, "Earth, earth, on the mouth of Oran that he may blab no more."

Ancient Sacrifices

But most victims of sacrifices were less fortunate than Oran. In Borneo, a deep hole was dug beneath the site of the building. The most beautiful maiden of the village was placed in the hole while the village witch doctors proceeded to batter her to a bloody death with a tree trunk. (Later the Irish tried to fool the devil and Earth's spirits and instead of sealing a live person in their castle walls, walled up a coffin. The Siamese rather than sacrifice one of their most beautiful damsels seized the first non-resident pedestrian who happened to pass the completed building. He was beheaded and while elaborate rituals were carried on, his blood was sprayed on the door step and building front.

Influence of Christianity

With the coming of Christianity, human sacrifice was replaced by animal sacrifice. The Romans went so far as to substitute statues and busts for the men to be sacrificed.

The early architectural conception of the sky was of a roof supported on pillars or posts. This governed the use of pillars in human habitations. Two pillars were used in recognition of the two entrances of day—one in the East and one in the West. Four pillars were used to represent the four cardinal points. Such importance was given to the four cardinal points that the angles of the building were turned to them as a matter of worship—North being the most mysterious point. The north side of cemeteries was reserved for suicides. In large early churches, pre-Christian era, the baptismal font was placed near the north door to provide a quick exit for the devil and evil spirits. During the baptismal ceremonies the north door was left open, so that the fiend might depart.

TECKNOKRAKS

Kappa Delta: "Are you troubled with improper thoughts?"
D. R. Haake: "Why no, I rather enjoy them."

Two pints make one cavort.

Employer: "So you've been to college, eh?"
A. E. Schubert: "Yeah."
Employer: "How high can you count?"
A. E. Schubert: "One, two, three, four, five, six, seven, eight, nine, ten, jack, queen, king."

She was only a farmer's daughter, but man how she did shock the corn!"

Heinig: "And there I was, my foot way up on the wall, and someone told me to bark."

"Go and never dampen my door again," said the old lady to the little pup.

Cliff Gano is now called "Zipper" for at a crucial moment this summer, his talon-equipped slacks jammed.

Calf (as it walks away from mama): I've had enuf teat.

Electrical: "I have electricity in my hair."
Chem. Eng.: "Maybe that's because it is connected to a dry cell."

The unluckiest man in the world —a seasick man with lockjaw.

Dear Dave (D. K. Harris):
I just read in the paper that students who don't smoke make much better grades than those who do. DAD.
Dear Dad:
I have thought about it. But truthfully, I would rather make a "B" and have the enjoyment of smoking; in fact, I would rather smoke and drink and make a "C." Furthermore, I would rather smoke and drink and neck and make a "D." DAVE.
Dear Dave:
I'll break your neck if you flunk anything. DAD.

The old fashioned girl who used to step out as fit as a fiddle now comes home as tight as a drum.

Jane: "When I don't want a man's attentions and he asks me where I live, I just tell him that I'm visiting here."
J. K. Brinkerhoff: "Ha ha! Excellent; but where do you live?"
Jane: "I'm just visiting here."

Come on grandpa, please tell me a bedtime story before I kick your damned shins.

A certain librarian was seen by a local photographer tying a piece of clothes line around the bottom of her skirt before her picture was to be taken.
"What's the idea of that?" he asked. "I can't take your picture that way."
"You can't fool me, young man," she replied, "I know that you can see me upside down in the camera."

You can't rise with the lark if you've been out on one the night before.

Alice D. V.: "Do you know what good clean fun is?"
H. K. Nagle: "I'll bite, what good is it?"

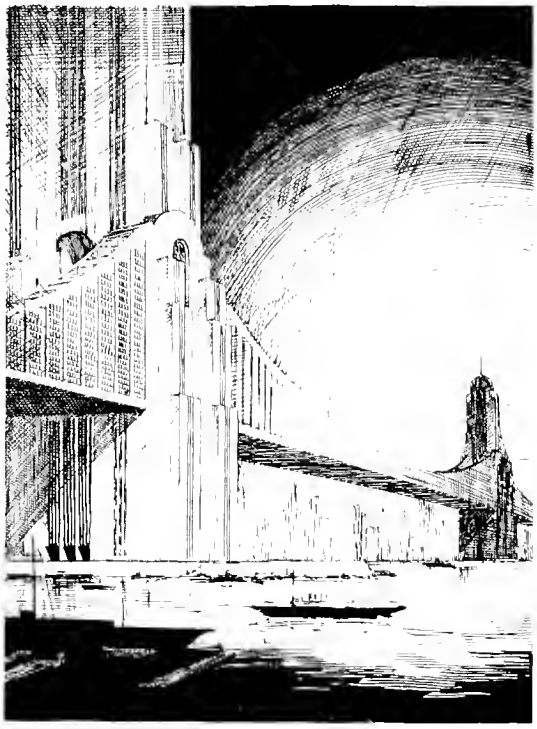
Many of our young engineers are spending a lot of time tinkering with the Misses in their motors.

O. M. Schneider: "From experiences I would say that if a woman looks young, she is old; if she looks old, she is young; and if she looks back, follow her."

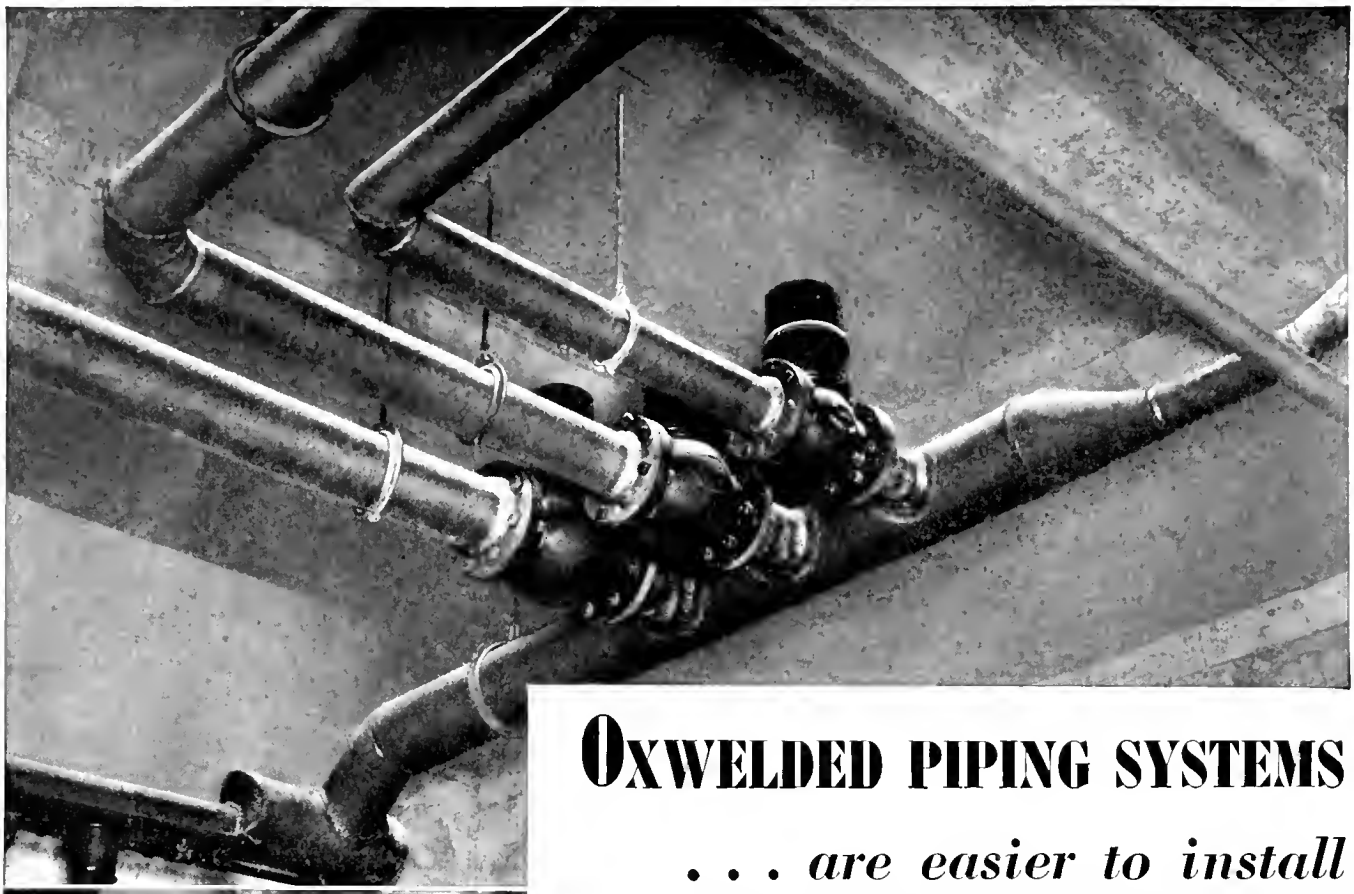
Science is resourceful. It couldn't pry open the Pullman windows, so it air conditioned the train.

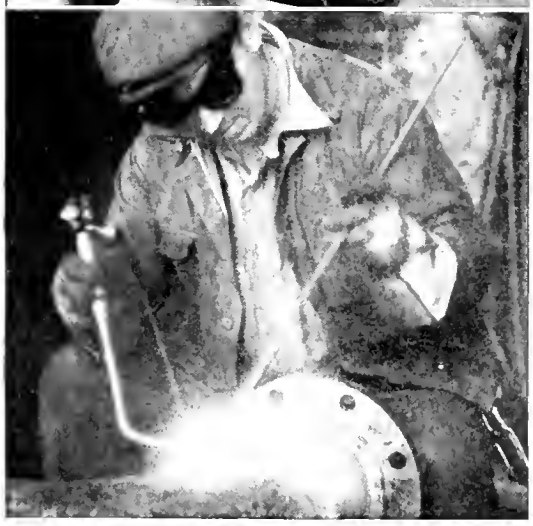
THE ILLINOIS

TECHNOGRAPH



MEMBER OF E. C. M. A.





On the installation shown above, the contractor fabricated by oxy-acetylene cutting and welding the bends, reducers, and other specials in his shop and installed them with tie-in welds on the job. The lines and bends were installed with a proximity which would have been impossible by other methods of joining. The insulation contractor estimated a 30 per cent saving on insulation labor because it was a welded installation.

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. . . *are easier to install and cheaper to maintain*

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THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

DECEMBER, 1935

Volume 50 Number 2

HOW students can develop their initiative to find and solve their own problems is told in the article on Thesis work appearing in this issue. Read the comments by a few prominent faculty men. It will be well worth your time.

● Illinois has pioneered in the field of concrete. Wherever concrete is known or used, there is known the name of Illinois. G. L. Jeppesen traces its development from the experimental stage to the present highly scientific concrete.

● The fall activities of departmental and honorary societies are reported elsewhere in this issue. Pledges, actives and first semester officers of the many honoraries are listed. The mention of the officers of the departmental societies and a resume of the society programs should be of interest.

● A new feature, the alumni page, should attract the attention of many. It discloses the whereabouts of a great many of last year's graduates. Space did not permit the listing of all of the employed men. All of the ceramists were placed.

● Do you read the editorials? The right Angle of this issue contains editorials on thesis work, blanket tax, and slide rule wizards. Why not voice your opinion on some appropriate topic? If enough of you are interested, we will inaugurate a "Voice of the Student" column.

Contents

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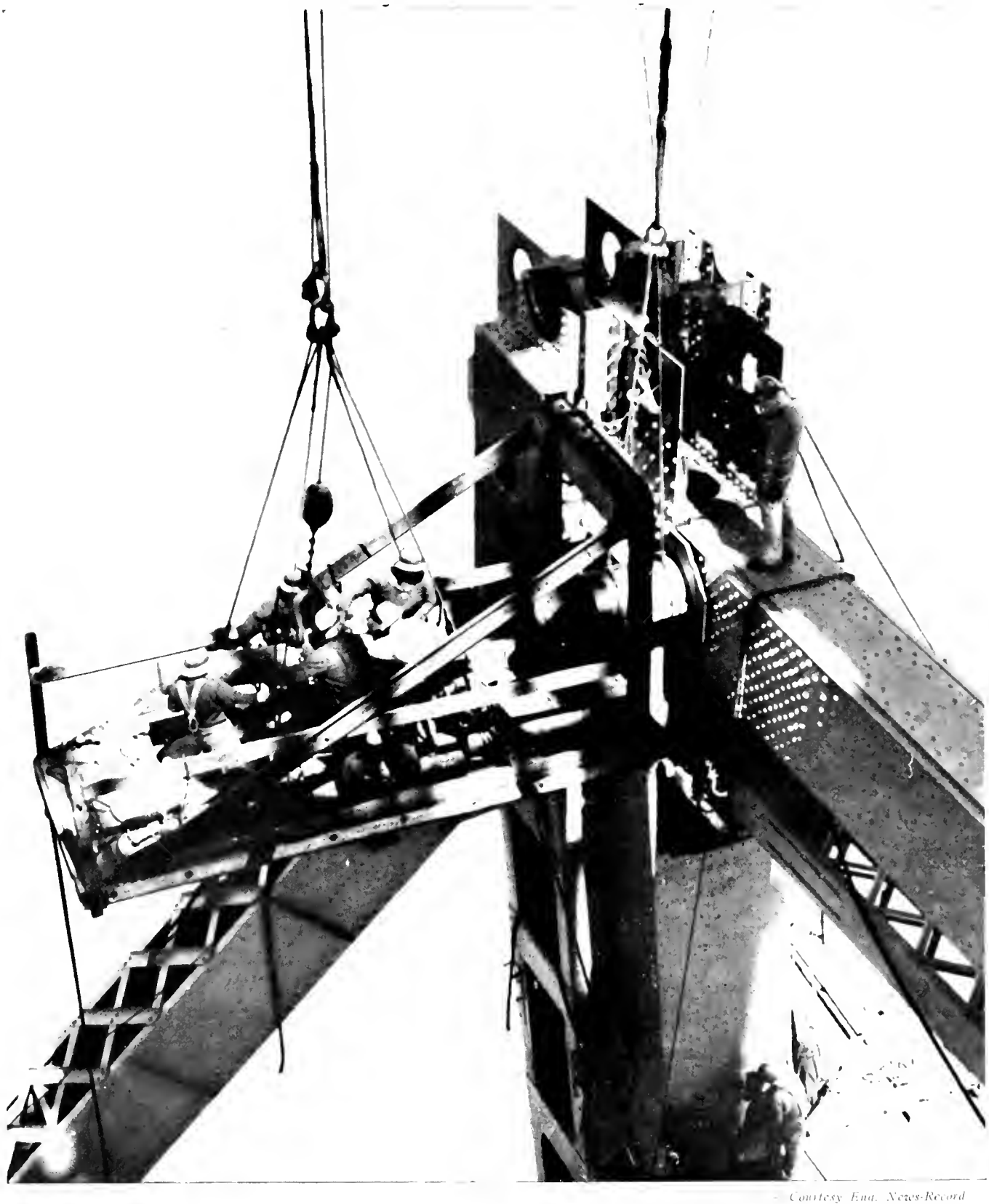


Courtesy Eng. News-Record

Workmen driving a 24-inch pin at the junction of the West Anchor Span of the longest cantilever bridge in the United States, the east bay crossing of The San Francisco-Oakland Bay Bridge.

THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume L DECEMBER, 1935 Number 2

Senior Thesis Work Revived

"Develope Self-direction," says Faculty

ARE those students who have shown outstanding interest and ability in their first three years of an engineering curriculum, getting all that they may get from their college education? The question is one that has been given very serious thought during the past year by several of the members of our faculty.

A student who reaches the senior year has had three years of intensive training in which he was carefully told what to do and how to do it. He would probably feel a little uncertain of himself if some day, in a complicated problem, he was given only the first instructions. By the time the senior year rolls around, the student has developed an attitude of mind in which he accepts without thinking, everything that is handed out to him by his instructor. It is true that a certain knowledge of fundamentals is very necessary, and can only be gotten by classwork; but some of it can be displaced by courses which are designed primarily to develop initiative and self-direction in the student.

Graduates Feel Need

The need for giving more emphasis to developing an attacking attitude of mind has been felt by many students, especially those who have contacted some of the recent graduates who have felt the need for it. The solution to the problem lay in making the student rely upon his own resourcefulness to a greater extent. It was with this in mind that the faculty stressed undergraduate thesis work this year for the first time in many years.

When the University of Illinois was founded in 1867, and until 1913, each student of an engineering curriculum was required to write a thesis on an approved research before he was permitted to graduate. Some of the most important of the bulletins of the Engineering Experiment Station were the result of discoveries due to undergraduate thesis work. In 1913, due to the rapidly increasing number of students in the engineering curriculum, it was found necessary to abandon thesis work. Facilities of the College were not large enough, nor was the faculty large enough to accommodate the increase. It was felt better to drop the thesis requirement rather than have the student work without proper supervision or encouragement. The Ceramic Department has continued to require a thesis from seniors since its start in 1916.

Student Picks Topic

Thesis work is quite different from ordinary classwork. The student is allowed to pick the subject on which he wishes to write. He is assigned to some stimulating member of the faculty who acts in the capacity of advisor rather than instructor. In most cases, the instructor is as interested in the work being done by the student as the student is himself. In fact, it is sometimes hard to tell who is the instructor and who is the student.

Undergraduate thesis work is limited to only the outstanding seniors. The term "outstanding" does not necessarily mean those who have the highest grades. Often men with average grades make better research students than their higher standing classmates. A real interest in the work is a prime requisite. The work carries through two semesters, having a weight of three credits each semester. It may be substituted for some approved technical subject.

DEAN M. L. ENGER
Dean of the College of Engineering

"Thesis work provides opportunity for the student to develop his capacity for self-directed study, to develop initiative, and to demonstrate originality. The student himself directs his thesis work and makes his plans in consulting with the instructor. Thesis work supplements the other courses in the curriculum in which the relations of the student to instructor are necessarily different. Unfortunately, the facilities in staff and in laboratories do not make it possible to offer theses to all students. It is necessary to restrict the offering to students of high standing and then only with the consent of the head of the department involved."

DEAN H. H. JORDAN
Assistant Dean of College of Engineering

"The preparation of an undergraduate thesis is a very desirable piece of work for any student to carry out who is at all interested in doing something of a scientific character on his own initiative. Planning the program of tests or analyses to be made, securing the actual data and facts to be studied, drawing conclusions from these data, and, finally, preparing a manuscript that sets forth these various facts and conclusions in clear and concise language, is so akin to the actual procedures followed in the practice of the profession of engineering that the opportunity of doing thesis work should not be thoughtlessly turned aside by those qualified to do it."

PROF. F. B. SEELY
Head of T. and A. M. Department

"Why thesis work? A student's development or growth under his own direction and initiative during the first few years after graduation is of great importance in determining his future success. The student who can find his own problems and has developed the interest and self-direction to attack these problems, will grow. Such an achievement is much more than acquiring information. A student can complete the four years of his course with good grades without having developed to the point of finding and attacking his own problems. Thesis work offers opportunities not available in other courses, to get a start on that self-development which counts for so much after graduation from college."

Illinois Men Active In
Development of Scientific Concrete
Much Progress Made in Past 25 Years

"IF we could only recover the lost art of making strong durable concrete and mortars that would last down through the ages as the ancient Romans have done, how wonderful it would be."

The next time you hear an uninformed person express such sentiments, fix upon him or her, as the case may be, a glassy stare and reply, "The concrete of today is so far superior to that made by the Egyptians or Romans that there can be no comparison. The ancient concrete and mortars owe their fine state of preservation to the perfect climate around the Mediterranean."

The Cleopatra obelisk, now in Central Park, New York, had stood for centuries in Egypt. Not long after it was removed to the United States it began to disintegrate. The structure couldn't stand our severe climate. The person who desires to compare the modern concrete with the ancient in such a derogatory manner probably has in mind some structure built about 1900 or before when there was little or no reliable knowledge of concrete design or proportioning.

Careful Control Exercised

What, then, has caused this improvement in the last thirty-five years in the quality of our concrete? The answer is, the development of a scientific concrete. There is nothing hit or miss about the concrete of today. Careful watching of the manufacturing of the cement, proportioning the concrete by the use of well founded and tested laws, and close inspection of the placing and mixing of concrete have been instrumental in producing the fine concrete of today.

Let us look back and see how all this came about. At the end of the nineteenth century we find that the dry mix was in vogue. The too little water used in the mixing of the concrete caused it be unworkable and necessitated much tamping and hammering of forms to get it into place. The refusal of the concrete to flow produced honeycombed structure that would make even a bee envious.

Because of the poor workability of the dry concrete, wet mixes came into use. As is often the case when there is too little knowledge, people go to extremes. The result was soup. Even the rawest sophomore Civil Engineer can tell you that adding too much water is the best known way to produce a weak concrete.

Reinforced concrete was gaining popularity at this time. In contrast to the lack of a theory of proportioning, there were too many theories concerning the design of reinforced structures. Most of them were either unfounded or impracticable.

Talbot Called "Father of Concrete"

So, we see, at the turn of the century, the design and proportioning of concrete was little short of a guess. The stage was set for some man or men to develop a practical system of reinforced concrete and a logical method of determining mixes. At the University of Illinois at this time there was a man blessed with a well developed sense of curiosity. He was Professor Talbot, often called "father of concrete." So great was his curiosity to obtain the results of an experiment that it was not unusual for him to keep his men workin throughout the night on data obtained during the daytime.

This man with the fine sense of curiosity was the pioneer in the field of reinforced concrete. In 1903 Professor Talbot issued the first of a famous series of bulletins in which he explained a practical, logical method of designing footings, walls, columns and slabs. His method was backed up by laboratory results. These bulletins acted as a shell bursting among ducks. It cleared the air of the many conflicting theories of design of that time. The majority of Professor Talbot's bulletins are just as good today as they were when first printed despite the great advance that concrete has made since that time.

Fuller and Thompson

Two years after Talbot's first bulletin, Fuller and Thompson published the result of their studies on the aggregates used in the making of concrete. They concluded that to get the best results the various sizes of sand and gravel should be in definite proportions and that the strength of concrete depended upon the amount of cement used. As a result of their first conclusion, they drew up what is now known as Fuller's ideal curve. They took what they considered the ideal aggregate, passed it through numerous sieves ranging in size from 1¼ inches in diameter to one-hundred holes per square inch and plotted the per cent of material passing each screen as ordinates and the diameter of the holes as abscissa. No attempt was made to determine the all-important question of what effect the amount of mixing water had on the strength of concrete.

Abrams Comes to Illinois

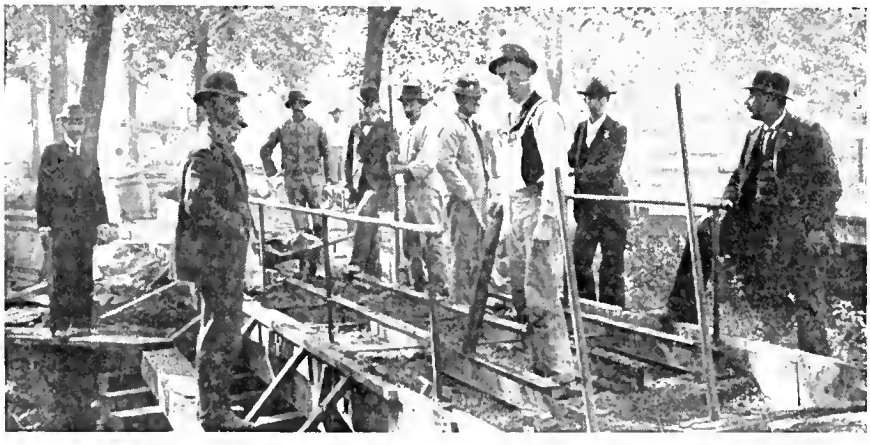
About the same time that Fuller and Thompson were publishing their results, there came to the University of Illinois to study under and with Professor Talbot a man intensely interested in the advancement of concrete. He was Duff A. Abrams, who was later to gain recognition with the Portland Cement Association. The Association was created in 1916. Their one desire was to obtain information concerning the effect of the mixing water on concrete strength. In looking for a man to undertake this important job, it was only natural that they should chose Abrams because of his brilliant work under Professor Talbot.

The Portland Cement Association soon found that their faith in Abrams was well justified. It was not long before he issued what is now known as Abrams' water cement ratio law. It stated, "With given concrete materials and conditions of test, the quantity of mixing water determines the strength of the concrete, so long as the mix is of a workable plasticity." In less technical language, Abrams found that the less water used, the stronger the concrete would be provided the concrete was not so dry that it became unworkable. Included in the A.S.M.E. bulletin, was a method of calculating the amounts of materials to be used to obtain any given strength or consistency. This bulletin of Abrams was the greatest advance made in concrete since Talbot's early work. Abrams' system of proportioning is the most widely used today.

Talbot and Richart Issue Bulletin

Following the publishing of Abram's bulletin, Professor Talbot and Richart became interested in the proportioning of concrete. As a result of their investigation, they issued a bulletin in

(Continued on Page 23)



Over the Boneyard on Burrill Avenue, one of the first reinforced concrete bridges in the United States. Dr. A. N. Talbot is at the extreme left, and the late Dean Ketchum is the second from the right.

News Unusual in Gay Nineties

Technograph Days of Labored Learning

1890 to 1906 in Life of Magazine

(EDITOR'S NOTE: *This is the second in a series of four articles recounting the history of the Illinois Technograph.*)

THE first four volumes, averaging about fifty pages each, were devoted largely to reprints of papers presented at club meetings. In 1890 the first change of a radical nature showed itself in use of the general title, "The Technograph." This change was caused by the Mechanical Engineers' Society cooperating with the Civil Engineers' Club, in the publication. That "The Technograph" is definitely the successor of the "Selected Papers" is definitely set forth in the fly-leaf of the 1890-91 Technograph, Volume V. "The Technograph is published jointly by the Civil Engineers' Club and the Mechanical Engineers' Society of the University of Illinois, and is the successor of "Selected Papers" of the Civil Engineers' Club, of which four annual numbers have been issued. The business manager who was first to publish the magazine under its present name was E. L. Scheidenhelm '92 and the assistant business manager was W. W. Martin '92.

In the following year, 1891, the Mechanical and Electrical Engineers' Society was made from the Mechanical Engineers' Society, and the Architects' Club was organized. These three clubs then, cooperated in printing the Technograph.

1895-96—In the 1895-96 issue, when John E. Pfeffer '96 was editor and H. G. Hattes '96 was business manager, The Technograph very definitely gave its reason for existence. The note on the flyleaf was as follows:

Reason for Existence Given

"The Technograph is a scientific publication issued annually by the Association of Engineering Societies of the College of Engineering of the University of Illinois. It is essentially technical in its scope, and contains articles of permanent value in the various departments of scientific investigation carried on at the university or by its graduates."

The preface referred to the Technograph as, "A medium, so to speak, through which the student and the professor, studying upon some special line of technical work, can communicate directly with those who are actively engaged in the engineering profession, and who are consequently placed in a position to best utilize the results of this study."

Law Building Was Library

1896-97—The frontispiece of the 1896-97 volume was a picture captioned "Our New Library." The student of today would recognize the Law Building of today. An article by James M. White, professor of Architecture, describes the building. To quote the article, "The style of the structure is Modern Romanesque—a style derived from that manner of building which prevailed throughout Western Europe from the fall of the Roman Empire, until the rise of the Gothic Styles, and was directly or indirectly inspired by Roman examples."

University Advertises

A two-page advertisement of the University itself, contains a list of the 29 professors and instructors of the University. Among them was Milo S. Ketchum, B.S., Assistant in Civil Engineering, and slightly above him in rank was G. A. Goodenough, B.S., instructor in mechanical engineering. Professor Arthur N. Talbot was then professor of Municipal and Sanitary Engineering.

The 1896-97 issue was under the direction of A. C. Hobart '97, the editor, and W. W. Sayers '97, business manager.

1897-98—The next issue, 1897-98, was rich in photographs and illustrations. There was a picture of some sort every few pages. The articles were of the usual technical nature, except the list of all the graduates of the college of engineering from 1872 to 1897. These figures stated that in 1872 there were only two graduates, and in 1897, 40 graduates.

The editor of that issue was S. F. Forbes '98, and the business manager, J. H. Young '98.

The University's advertisement in that issue advertised "fifteen buildings, 211 instructors and 375 courses." A pictur e of University Hall, as the "Main Building," was shown.

Colored Plates Appear

1899-1900—The editor at the turn of the century was G. R. Radley '00, and the business manager was W. S. Church '00. The influence of the architectural students is seen in this issue in the six pages of plates of various paintings and statuary. Such things are unheard of today in our Technograph.

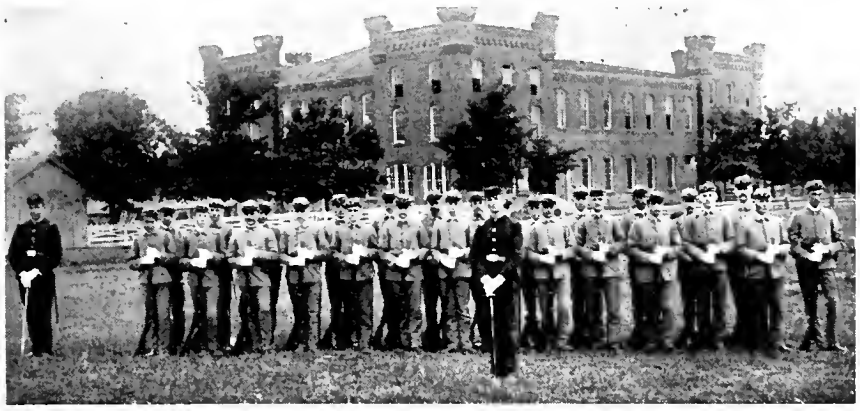
1900-01—The fifteenth volume was lished in 1901, and the editor and business manager, C. T. Drury '02, and H. W. Baker '01, included a complete index of the first fifteen volumes. It is interesting to note that there were 251 articles listed in this index.

1901-02—L. A. Waterbury '02 and F. L. Swanberg '02 were the first editor and business manager to include a picture of the entire Technograph Board. The volume for 1901-02 also included pictures of the Water Works Station, the Hydraulics Laboratory, Engineering Hall, Foundry and Pattern Shop, the Machine Shop, the Heating Plant, Mech and Electrical Engineers' Laboratory, and the Chemistry, Gymnasium and Agricultural buildings, which are now known as the "Old Gym," "Old Ag," and merely "Chem." building to distinguish them from the newer buildings since built.

1902-05—During the next three years, under the guidance of H. Huss '03, J. T. Vawter '04, and Ernest E. Meir '05 as editors and, J. T. Vawter '04, J. E. Shoemaker '05, and F. W. Marquis '05 as business managers. The Technograph held up its high standard but no radical changes came until 1905-06.

Local Interest Stories Printed

1905-06—Under the editorship of C. C. Rich '06 and C. C. Carr '06 as business manager, The Technograph made a definite step away from the strictly technical publication it had been in the past. The new policy, as outlined on the flyleaf of volume 20 is here quoted, "This number of The Technograph has been prepared with the idea of making it possible, representative of activities in and about the Engineering College, not alone of the instructors and heads of departments but especially of the students and undergraduates whose publication this should be. Effort has been made to secure articles which will interest students in every department. There is considerable material of purely local interest. Many important tests and experiments are being conducted in our laboratories which, although not now complete and ready for publication, are mentioned and explained, thus assuring our readers of valuable data to be published next year. (To be Continued.)



—Courtesy Alumni News

Company of cadets in the 1890's. The drill hall and shop is in the background

Engineering Honoraries

Honor Societies Announce New Men

Tau Beta Pi

At a recent meeting, Tau Beta Pi pledged the following: W. E. Black, R. W. Cline, W. A. Depp, F. H. Dubsky, G. P. Entrekin, C. B. Graham, R. J. Kowalski, G. Krambles, R. W. Leutwiler, Jr., J. W. Luce, B. T. Sear, L. Silverman, H. J. Sprengel, and the honor junior, Norman Schoeppel.

Tau Beta Pi is a national society organized for the purpose of recognizing superior scholarship coupled with the qualities of leadership, integrity, and character as undergraduates, or the attainments as alumni; and to promote a spirit of liberal culture in the engineering schools of America. In 1885, Lehigh organized the original chapter as the result of a long-felt need for an organization of this kind. Today, there are sixty-six chapters in schools throughout the country.

The Illinois Chapter is fortunate in having sixty-eight of the faculty as members: Pres. A. C. Willard, and Professors H. H. Jordan, W. N. Espy, and H. E. Babbitt serve as faculty advisors. The officers for the first semester are:

W. E. Hendricksen.....*President*
A. E. Bitter.....*Vice-President*
E. C. Robertson..*Recording Secretary*
G. L. Jeppesen.....
.....*Corresponding Secretary*
J. D. Taylor.....*Treasurer*
R. C. Hieronymus.....
.....*Master of Initiation*

Present members of the chapter are: C. A. Pippin, J. H. Stein, E. P. Carter, P. G. Gray, D. K. Harris, E. A. Post, R. C. Pitney, C. G. Talbot, D. D. Streid, W. G. Johnson, and W. J. Wayne. It is hoped to include in the year's program a number of social functions in the nature of dinners and addresses.

Chi Epsilon

Chi Epsilon, organized in 1922 at the University of Illinois, has since spread to thirteen other colleges, and is an organization "founded to recognize scholarship, and to develop sociability and practicability among Civil Engineering students." Its members are selected from the upper ten per cent of the junior and senior Civil Engineers.

Officers for the first semester are:
J. D. Taylor.....*President*
A. F. Scholes.....*Vice-President*
W. W. Duke.....*Secretary*
F. Rue.....*Treasurer*
R. Hieronymus.....*Editor of Transit*

The remaining active members are: S. W. Benedict, J. E. Buck, A. E. Bitter, and K. King.

The following men are now pledged to the organization: D. S. Dippold, R. H. Menefee, T. B. Sear, K. Damitz, H. E. Skinner, W. E. Willard, W. G. Kahl, H. P. Kibbey, and W. A. Renner.

Pi Tau Sigma

T. N. Hackett, A. Sharav, C. L. Rabe, G. H. Logan, J. W. Spaulding, R. T. Lee, and R. H. Benedict are pledged to Pi Tau Sigma, honorary Mechanical Engineering fraternity. D. G. Ryan is an honorary pledge.

Pi Tau Sigma was organized to foster the high ideals of the Mechanical Engineering profession, and to develop a congenial friendship among the students and a better acquaintance and mutual understanding between the students and the faculty. Juniors and Seniors are eligible to active membership in the organization. New members are chosen by unanimous consent of the active members.

Officers of the society at present are:

D. K. Harris.....*President*
R. W. Leutwiler.....*Vice-President*
C. B. Graham.....*Secretary*
J. W. Luce.....*Treasurer*

A number of social gatherings comprising smokers, picnics and banquets when a short speech is usually delivered by a member of the faculty or a prominent engineer constitute the main activities of the group.

This year's members include: L. H. Collison, F. B. Foster, T. J. Herrick, J. W. Herrington, R. P. Lynch, J. E. McMahon, L. Silverman, W. J. Wayne, E. A. Travis, and D. K. Mitchell.

Eta Kappa Nu

W. E. Miller, P. R. Egbert, R. F. Lange, R. J. Kowalski, F. H. Dupsky, J. J. Quorollo, J. Krcek, W. D. Orr, E. C. Chamberlin, and G. N. Germand will soon be initiated into the local chapter of Eta Kappa Nu.

Eta Kappa Nu was organized to bring into close union those men in the profession of Electrical Engineering who have manifested a marked ability in their chosen work. It has been established on several campuses and has long been recognized as an active and fruitful organization. Serving as officers this year are:

J. H. Stein.....*President*
E. A. Post.....*Vice-President*
W. A. Depp.....*Treasurer*
C. G. Talbot.....*Corresponding Sec.*
Russell Jensen.....*Recording Sec.*

The remaining active members are W. G. Spangler, R. C. Pitney, J. E. Burgess, and G. P. Entrekin. The members of Eta Kappa Nu are in a large measure responsible for the success of the Biennial Electrical Engineering Show and this year it is the plan of the officers to bind the members closer together by having several dinner meetings.

Keramos

Keramos, honorary Ceramics Society, was organized to promote professional fellowship among students of Ceramics. Its membership represents quality rather than quantity. The officers elected for the present semester are:

J. C. Bell.....*President*
W. C. Pittman.....*Vice-President*
N. Schoeppel.....*Secretary-Treasurer*
E. B. Clark.....*Herald*

The entire Ceramics faculty are members including Prof. C. W. Parmalee, Dr. A. I. Andrews, C. L. Thompson, Prof. R. K. Hursh, W. R. Morgan, and A. E. Badger. The student members are: L. A. Spires, R. G. LaBaw, W. M. Turner, and J. Stevens. Pledges have not yet been nominated.

Synton

H. J. McSkimin, Ray Kempf, and R. S. Darke were recently pledged to Synton, national professional radio fraternity.

Synton was organized at the University of Illinois in 1926 for the purpose of banding together the radio amateurs and experimenters on the campus. The meetings are devoted to discussion of items of current interest in radio, and a code class is offered to those wishing to increase their speed. The organization maintains a modern, powerful station located in the Armory for the use of its members. The officers for the present semester are:

F. A. Linn.....*President*
W. B. Katz.....*Vice-President*
W. A. Depp.....*Secretary*
H. Bigger.....*Treasurer*
H. M. Flora.....*Chief Operator*

Other members include: D. Chinlund, R. W. Cline, O. L. Denhart, W. L. Eddy, E. W. Hough, W. J. Moritz, J. C. Skorez, J. H. Wainscott, W. Phillips, J. L. Dennis, and J. A. Krcek.

Honorary members include Lt. Col. S. L. James, Prof. C. T. Knipp, Prof. H. A. Brown, Prof. J. T. Tykociner, Dr. D. G. Bourgin, Mr. C. E. Skroder, and Mr. F. Wiley.

Tau Nu Tau

R. K. Bauerle, J. R. Bingham, R. M. Campbell, S. N. Eilertson, W. R. Eldon, H. S. Evans, W. Fay, J. J. Gibberman, D. D. Godfrey, T. N. Hackett, C. E. Johnson, G. H. Jones, H. H. Kern, A. J. Kusch, W. S. Lamb, K. Lindley, G. H. Logan, F. Marich, E. H. Olson, F. F. Poppenburg, R. C. Purl, W. A. Renner, R. B. Shanks, E. T. Simonds, H. E. Skinner, B. K. Slonneger, W. Walsh, and W. R. Weldon have just been initiated into the ranks of Tau Nu Tau.

Tau Nu Tau, often referred to as T. N. T., is an honorary military engineering fraternity. It has become quite popular on this campus during the last few years. The main activities of the fraternity are in promoting sociability among its members. The present officers are:

T. S. Johansen.....*President*
F. C. Heinig.....*Vice-President*
W. E. Black.....*Treasurer*
C. M. Slaymaker.....*Secretary*

The other actives are: J. W. Boyd, J. K. Brinkerhoff, R. J. Christmann, S. N. Daniels, W. A. Farley, P. R. Faris, W. E. Hendricksen, H. L. Hyndman, R. J. Johnson, P. J. Kunzer, M. W. Levy, L. M. Moore, W. G. Reynolds, W. R. Richardson, C. P. Royer, C. J. Smittcamp, L. C. Wilcox, C. L. Pruitt, C. U.

Prout, W. J. Senters, E. M. Volle, C. B. Namensky, and J. W. Herrington. Faculty members include: Capt. A. G. Matthews, Lieut. R. K. McDonough, and Sgt. S. H. Mount.

Pi Tau Pi Sigma

Pledged to Pi Tau Pi Sigma are: W. H. Dean, T. Woltanski, D. E. Laub, R. G. Clay, J. Martain, F. A. Linn, A. Dyson, and H. D. Townsend.

Pi Tau Pi Sigma is a national military fraternity open to advanced Signal Corps students. The Gamma chapter is one of eight chapters in existence at the present time. The present officers are:

P. H. LANPHIER.....*President*
E. OLMSTEAD.....*Vice-President*
E. A. POST.....*Treasurer*
E. C. ZAWISTANOWICZ.....*Secretary*

Other active members are: J. W. Bodnar, W. Crochett, W. H. Janssen, H. J. Nagle, F. M. Miramonti, and J. R. Williams.

Theta Tau

Already pledged to Theta Tau are: R. F. Batt, G. F. Banks, Bradley Gardner, H. Whildin, and R. C. A. Purl.

Theta Tau is a Professional Engineering Fraternity organized to maintain a high standard of professional interest among its members and to unite them in fraternal fellowship. Its dinner meetings have always been interesting and entertaining.

Among the faculty Theta Tau claims as members: T. J. Dolan, J. J. Doland, A. M. Jorgensen, E. E. King, O. A. Leutwiler, W. J. Putnam, T. C. Shedd, J. O. Vawter, and W. M. Wilson. Student officers for this year are:

N. JEPPESEN.....*President*
P. GALLAGHER.....*Vice-President*
R. W. LEUTWILER.....*Secretary*
W. A. MERLE.....*Treasurer*

G. Jeppesen, C. A. Grotz, W. C. Hitchcock, J. J. McGeough, A. A. Parquette, A. Reichmann, and H. D. Townsend are the other active members.

Mu San

Mu San is a national organization to promote good fellowship among the students and faculty interested in Municipal and Sanitary Engineering. The Illinois Chapter has always been quite active and has acquired a reputation for interesting meetings. Officers for the year are:

L. T. STOYKE.....*President*
R. B. REYNOLDS..*Vice-President-Treas.*
J. H. STEPHENSON.....*Secretary*

The new actives are H. W. Atkinson, W. W. Dukes, F. E. Wisely, and C. E. Wright. Other actives are S. W. Benedict, T. F. Scholes, E. M. Volle, W. S. Feagan, A. W. Kieth, E. G. Simonds, J. A. Parker, J. C. Deisenroth, and R. E. Brendel. Mr. W. M. Lansford of the T. & A. M. department was made an honorary member at the recent initiation.

Faculty members include A. N. Talbot, M. L. Enger, H. E. Babbitt, J. J. Doland, J. S. Crandell, R. V. Fleming, G. W. Pickels, C. C. Wiley, A. M. Buswell, E. W. Suppiger, W. L. Collins, W. D. Gerber, and H. L. White. H. P. Eddy, past president of A.S.C.E., and Paul Hanson of Chicago are honorary members.

Europe Quick - Time

Mr. Chu Corners Prof. J. S. Crandell

EDITOR Technograp say, "Chu get big story tell engineer how's how in Europe. Must do Interesting and gripping." Chu reply, "I get. Make engineer know all Europe quick time." Chu dash away and find Prof. Crandell. Get story. Hope you enjoy.

Chu knock on door. Voice say, "Come in." Technograp reporter walk in. Reporter present self say, "How de do, Prof. Crandell, present Mr. Chu of Technograp; hear you been recent trip; how you like, velly fine?"

Prof scratch head and reply, "Yes, make big trip, have good time enjoy velly much."

Meantime Chu pull out shirt tail and pencil and ask, "How you like to tell Technograp reporter all about big adventure and travel." Prof. nod and start give story.

"I and family leave Urbana on big misty morning in February, foggy and look not more ten feet distance. Spend all night packing, finally fix up car and start New York 5 o'clock in morning. Piston rings bad so money melt quick cause car eat qt of oil every forty mile. But we get to Harrisburg, Pa. and with big engineer technique stop side of road to stall new piston rings. Fingers frozen like ice but continue on and reach New York when Mrs. drive car. New York heat down to 15 degree so hurry leave big city. Scout all night, find pontoon for car and tie car to boat Saturina and hitch way to travel Europe. Save money. Remember signal system in civil engineering and talk skipper pass food and family gain weight on good Italian spaghetti. Stop in mid-ocean at Azores, find fine dessert for meal in pineapple, good Appetizer no good Brandy very very terrible. Leave Azores, Next stop Lisbon. Lisbon, see more trolley than New York and fare only 2 cents. Service very no go good, stop at every railroad crossing, Gate down fifteen minute before train scheduled arrive and train always two hour more late. Meantime, buy junk from peddlers.

Chu interrupe, "Velly velly bad, Make distinguished visitors wait. Chu improve service when degree obtained, make change and improve efficiency all way round."

Prof. smile cont'd. "Boat leaves Lisbon and car work 100 per cent efficiency, no use oil, gas; boat furnish power, cost nothing, maximum efficiency. Pass Gibraltar and John Bull guns puncture pontoon. Wear white underwear to signal surrender. Hang to running board and fix puncture. Small stops northern coast of Africa. Finally reach Italy. Boat stop at Naples when soupy fog over city. I and family go to the city. In fog people mistake for Italians and make us learn "Vive Mussolini" before leave Naples. Move to Trieste and see nice clean city: Take pontoon off car. Stop at gas station buy gas 75c a gallon. Feel self on terra firma so drive to Venice. Venice connected to mainland by new 180 feet highway, four mile long. Old bridges in very bad shape New ones very good design and very beautiful. Some street foot wide and make difficult walk after eat big dinner in exquisite hotel with excellent dish made fried onion top. Leave Venice, Visit Rome and Hear Mussolini speak. He very kind and cordial, bowed me after the speech. After see Italy, drive on France. Gas drop to 52c gallon. See beautiful ancient art centers. Crossed Rhine to Germany where people happy and fat from drink famous Rhine Wine. New roads in Germany save much trouble, No have stop fix puncture and flats."

Chu reply, "I no like flat too, especially when pocket flat. Chu no get anything free. How about Hitler?"

The smart engineer rub chin and chat on, "Hitler velly fine engineer. Design beautiful brown house in Munich, velly velly beautiful; We go to England, have big welcome. Invite me review fleet maneuver but weak from journey decline invitation and honor. Next morning see King George walk happy down street. He greet me when I stand on sidewalk observing Royal Highness. England velly powerful in land, sea. Food sure velly no good."

Chu commented, "Velly interesting trip, make engineer think and use engineering knowledge; Maybe, myself, see world in near future. How's trip home, any excitement?"

"Yes plenty" growled Prof. "Had another bad luck with British, this time had big auto crash. Good American car fall to pieces. Make myself angry and take boat of Baltimore Mail Line back to good old campus of Urbana."

"Really, it's too bad," Chu replied in low tone and sympathetic, "Velly velly bad, spoil smart engineer' good record of hike hitch back forth across water. Better luck next time, Thanks for story. Bye bye now."

KEYS DEDICATED TO FRANK MORROW

The Chi Epsilon scholarship keys, given each year to the sophomore and freshman having the highest scholastic average in the C. E. department, will be known hereafter as the Frank Morrow scholarship keys. Morrow was killed in an automobile accident while enroute to his job as a construction engineer on a government project at Keithsburg. It was he who originated the idea of giving the awards last year. Last year's winners were Harry Skinner and Harold Goeke.

The awards will be presented this year at a banquet to be held on December 18. The winners for this year have not yet been announced. Frank Sheets, consulting engineer for the Portland Cement Association, will be the principal speaker. All Civil Engineers are invited to attend.

BEG YOUR PARDON

We wish to correct at this time a table that appeared in the September issue of the Technograph, giving College of Engineering enrollment figures since 1870. The architects have not been under the jurisdiction of the College of Engineering since 1932. The total column is correct as it stands.

Little Known Facts Revealed As

PROMINENT FACULTY MEMBERS

Unfold Life Stories

PROF. A. R. KNIGHT

The son of a prominent and the father of a promising engineer is in our midst. In fact he has been with us now for over twenty-two years. When the Illini met the "Scarlet Scourge" recently, Professor Knight was cheering for the defeat of his Alma Mater; but he graduated some twenty-six years ago and so the Buckeyes have no reasonable claim upon him.

Professor Knight has done much to make Champaign-Urbana an illuminated community. In fact he designed the street lighting system now in (occasional) use in the twin cities. Hundreds of embryo-engineers have passed by (or leaned against) a local street light without realizing that here was concrete evidence of an engineering problem well-solved. The usual line voltage on lighting systems before this installation was about 3000 volts, because large numbers of lamps had to be connected in series. Professor Knight conceived the idea of using insulated transformers to be energized by low voltages, each transformer in turn operating small groups of lights. As a result, the highest voltage carried is about 375 volts. Safety and economy have been gained. The idea was new; development charges had to be included in the cost of the system; but the plan was sound for it has since become standard equipment.

Professor Knight's interest in athletics is purely mental, even as to exercise. That is to say, if he feels the need of a workout he watches the track team practice; if the team has had a rather strenuous session he watches them take a shower; then, much refreshed, he calls it a day.

The professor's history, activities, and interests are so extensive, they practically require listing. He has had an interesting and varied career both in everyday and campus life. We will hit only the high lights. First of these, of course, is the fact that he was born in Columbus, Ohio. After graduating as an E. E. from Ohio State in 1909, he worked with several power companies and has continued to do so in the summer since joining the staff at Illinois. He was a member of the student affairs committee for the first four years of its functioning, serving as chairman for three years; is a member of the Illini theater board of directors, a member of Sigma Pi, of Tau Beta Pi, Eta Kappa Nu, Scabbard and Blade, Sigma Tau, and an honorary member of Triangle. He has had several articles published, for the most part in such publications as "The Electrical World."

His chief hobbies are hiking and camping. His interest here is a thorough one, for he has been a scoutmaster for five years, scout commissioner for five years, and has received two important awards in this connection, the Scoutmaster's Award, based on five years' service, and other items of merit; and the Silver Beaver Award for outstanding service to boyhood.

And so we have given you a brief outline, all of which conveys only a meager part of the interesting personality that is Professor Knight's.

PROF. F. B. SEELY

Professor Seely was as much a star in his chosen sports as his son, Irv Seely, last year's track team captain. Professor Seely was captain of the baseball team and quarterback of the football team in his high school days, spent

Prof. F. B. Seely

in his home town in southeastern New York, near West Point. In 1907, after proving his consistency by again being captain of the baseball team and quarterback of the football team in college, he received a B.S. degree in M.E. at Worcester Polytechnic Institute, Worcester, Massachusetts. After two years of practice in the east he came to the University of Illinois and became a member of the T. and A. M. department. In his time here he has become head of the department.

Among his publications are three widely used texts, well known to Illini engineers. They are his "Resistance of Materials," his "Advanced Mechanics of Materials," and his "Analytical Mechanics for Engineers" of which Professor Ensign is co-author.

Professor Seely is a member of Phi Gamma Delta, Tau Beta Pi, Sigma Xi, the A.S.M.E., the A.S.T.M., the S.P.E.E. and other like organizations. He has served on committees for several of them.

The professor favors student participation in activities and athletics. This may surprise those who picture the T. & A. M. department as some ultra-technical monster ready to pounce on the unhappy engineer who strays south of Green Street. He applies "Moderation in all things" to the above recommendation, however. Professor Seely carries his ideas of social connections into his own life, too; he is a member of the Kiwanis Club, vice-president of the Boy Scout Council for this area, and has served as an alderman in the city of Urbana for three years.

The chief fault Professor Seely finds with the present educational system is the lack of self direction in the students. He believes that much of the value of any work being done is lost when it is portioned off and due at 2:17 next Thursday, or else——. He believes the student should arrange his own time and assignments.

Professor Seely believes there should be some outlet for the considered judgment of the students. He likes opportunities to converse with them. Anyone who has such an opportunity should take advantage of it. The professor has some very interesting "off-the-record" views.

PROF. C. W. HAM

1881—Born in Carlisle, Kentucky.

1905—University of Kentucky comes through with B.M.E.

1908—Cornell rewards with degree of M.E.

1908-1913—Mr. Ham dishes it right back at Cornell as instructor in Machine Design—but in the meantime,

1909—Marries Miss Martha Dunn in the old home state (also in this connection, bouncing Willburt D. arrived somewhat later).

1911-1917—Mr. Ham continues at Cornell, but in the more dignified role of Assistant Professor.

1917-1921—Seeking new fields to conquer, C. W. H. holds down responsible positions with Gleason Works, Rochester, New York.

1921-1926—Levels guns on student body in good old Urbana as Assistant Professor of Machine Design.

1927-date—continues bearing down on Illini engineers—but now with austere demeanor of a full professor.

Publications? — Numerous, varied. Chief items, "Pipe and Pipe Fittings" section in "Mechanical Engineers' Handbook" and text "Mechanics of Machinery."

Research? — Oh, yes. Gears and threads are his chief interests here.

Memberships?—To be sure. A.S.M.E., S.P.E.E., Tau Beta Pi, Pi Tau Sigma, Sigma Xi. (Several committees on the first two).

Hobbies and interests?—Books; football and baseball, as a spectator.

Good descriptive phrases—(faculty)—congenial companion. (Student)—good egg.

For further details arrange a conference in room 110 Transportation.

(Incidentally, the time would be well spent.)

200 Engineers Go On
SENIOR INSPECTION TRIPS
Required for Graduation

APPROXIMATELY two hundred senior students and professors took engineering inspection trips to plants in Chicago, Milwaukee, and smaller towns in Illinois.

A total of 191 undergraduate students, all seniors, a few graduate students and 14 instructors took part in this trip to establishments operating in the line of business or manufacture for which they are training.

The trips which are required by the University for graduation, were taken by eight groups, the ceramic, electrical, general, railway, agriculture, civil, mechanical, and mining and metallurgical engineers, each taking a separate trip. The chemical engineers had their inspection trip one week previously.

Wednesday evening, October 30th, the tours which were to be taken near Chicago and Milwaukee left by train for Chicago staying at the Atlantic Hotel, so everyone might be rested up before proceeding to the plants to be inspected; however, the inspection really began as soon as the bags were placed in their respective rooms.

●

Agricultural Engineers

Leaving the hotel Thursday morning the group visited the Wisconsin Steel Works in Chicago where the fascinating process of manufacturing steel was viewed.

While in Milwaukee, after inspecting the Harnischfeger Corporation, the party entered the Allis Chalmers Company and saw the making of large motors and transformers. On the return trip, the Waukegan Generating Station of the Public Service Company of Northern Illinois proved a very interesting place and it was enjoyed by all present.

●

Ceramic Engineers

The ceramic engineering students, travelling as a unit in a chartered bus, left the Ceramic Building Thursday morning.

The first plant visited was the Illinois Clay Products Co. at Morris, Illinois. Although the principal business of this company is supplying fire clay to industrial plants, these students were able to observe the forming of dry press refractory shapes used as cupola linings. An interesting new product being developed by this company is an insulating brick, using as one of its constituents, Vermiculite, a micaceous mineral which expands to fifteen times its normal volume when heated.

Another interesting plant was the Owens-Illinois Glass Co. of Streator, Illinois, where beverage bottles were being manufactured at the rate of 100 per minute.

●

Chemical Engineers

Thursday morning, October 17th, this group visited the Universal Atlas Cement Company in Buffington, Indiana. The Grasseli Chemical Co. was viewed in the afternoon.

At the Shell Oil Refining Co. a most interesting modern development was viewed. It was the newly constructed Polymerization Plant for the production of gasoline from low carbon chain vapors. At the Sherwin-Williams Paint Co. the manufacture of colors of paints was viewed.

This bunch, while at the Argo Starch Company, saw the process of putting the kernel of corn through a beating and the recovery of the by-products.

●

Civil Engineers

Of the various plants inspected by the C. E.'s the American Bridge Co. and the Southwest Sewage Disposal Plant proved to be the most interesting. The American Bridge Co. was framing some of the huge members for the Oakland-California Bridge. The girders and columns were of such proportions that we gazed amazingly at them. Imagine a sewage disposal plant taking care of a population of 3,500,000 people. Only about one-half of the work was completed but we got an eyeful. Here's an inkling of its immensity: 16 aeration tanks, 36 ft. in width and 434 ft. in length; 32 settling tanks, 126 ft. in diameter and 11 ft. deep. We were all thrilled when we went down 65 ft. into a large oval shaped sewer, 19 by 17 ft. in dimensions.

●

Electrical Engineers

Thursday morning at 8:30 we left for the G. E. x-ray plant. Here we saw not only how the x-ray tubes were made, but also were told how to operate one. Next we proceeded to the G. E. Appliance Co. where we saw the Hot Point products being made.

Thursday afternoon was partly spent at the Civic Opera Building and the Chicago Lighting Institute. Here the group saw some of the latest illumination designs for flood lighting, decorating, and interior lighting.

Arrival in Milwaukee enabled the party to ride on one of Milwaukee's better streets cars to the Harnischfeger Corporation where we saw the use of electric welding in modern industry. The afternoon was spent going over some of the 23 acres included in the Allis-Chalmers plant.

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General Engineers

Journeying from Chicago to Gary this group visited the American Bridge Company and the Carnegie-Illinois Steel Company. At the latter plant the steel making process was viewed in full swing. On a special North Shore line train stops were made at two sub-stations enroute to Chicago; one being a Mercury Arc Rectifier and the other being a Synchronous Converter Station.

To put a finishing touch to a fine trip the group visited the Museum of Science and Industry where the modern underground coal mine was viewed in operation.

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Mechanical Engineers

On Thursday morning this unit were taken by bus to the Wisconsin Steel Works in South Chicago. The nine steel furnaces held the group spell bound as they watched over 250,000 pounds of molten steel being poured from each furnace.

The Crane Company had a great deal that was new and everyone was impressed by the size of the place and the processes being carried on.

After spending Friday morning at Allis Chalmers, the afternoon was spent at the Kearny-Trecker Company which was host to the group and caused considerable comment about the spirit and interest shown by the employees. This unit also viewed the Waukegan station of the Illinois Public Service Company on Saturday and enjoyed the visit.

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Railway Engineers

Viewing the G. E. x-ray plant this group was able to see how x-ray tubes were made and operated.

Enroute to Chicago this group took part in inspecting the Mercury Arc Rectifier and Synchronous Converter sub-stations.

To complete a memorable trip the R. R. engineers inspected the Markham Yards and the Burnside Shops both of the Illinois Central Railroad.

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Mining and Metallurgical Engineers

With a bright early start the Mining and Met. engineers left for Peoria at 5:00 A. M. At the Crescent Mines various means of loading sizing coal were viewed. In Farmington large electric shovels were viewed as well as a modern method of washing and drying coal. The metallographic and chemistry laboratories of the Keystone Company were also inspected.

After spending the night at the Illinois Mines Rescue Station in La Salle the party visited the Illinois Zinc Company in Peru. Late Friday afternoon was spent at the Utica Cement Company in Utica, Illinois. At this plant natural cement is mined, dried, pulverized to minus 200 mesh, and packed.

●

The parties upon disbanding no doubt had a greater store of knowledge (we hope) and a great deficiency in sleep. The mechanical equipment of the plants visited added much to the students' knowledge of modern processing methods which is seldom obtained from books. All in all such trips as these prove that the educational advantage resulting from the inspection of large industrial enterprises fully justifies the time and expense involved.

• WHO'S WHO IN ILL

● C. G. Talbot

● W. E. Black

● R. W. Leutwiler Jr.

CURTIS TALBOT, a transfer student from Western State Teachers College at Macomb, is really setting an example for the rest of those Electrical Engineers. His scholastic standing is high enough to have gained for him membership in Tau Beta Pi and Eta Kappa Nu. As first semester president of the A. I. E. E., Curtis has led the organization to one of its most successful years in several. Last summer he was employed by a manufacturing concern in Chicago. He can really tell you all that you would like to know about "Henry's product" because he worked in the Ford exhibit at the World's Fair in 1934. The Skull house keeps him within the traces and furnishes him with the chance to get in some good "Bull sessions" about radio.

WINSTON BLACK is a C.E. who has learned just exactly how to mix work and play and still do very well in both. As a freshman, Winnie distinguished himself by making the required grades for Phi Eta Sigma. He has topped his scholastic achievements in his senioir year by making Tau Beta Pi. After attending the R. O. T. C. camp at Camp Custer this summer, he found his time well occupied in getting speakers for the A. S. C. E. this semester. He is secretary of that organization. Winnie is a captain in the R. O. T. C. and holds the double job of treasurer for both the local and national chapters of Tau Nu Tau. He is well known over at the Y. M. C. A. where he served on the social committee. He is an independent hailing from Chicago. Winnie stands out in most any sport.

RICHARD LEUTWILER is another energetic M.E. When he has the time, he likes to put his theory into practice by tearing cars apart and then trying to find out where the extra pieces go. During the past summer, he was employed in the electrical department of one of Chicago's large packing houses. As a freshman, Dick obtained the key of Phi Eta Sigma as a reward for his hard work, and as a senior, he became a member of Tau Beta Pi. He is at present, the vice-president of Pi Tau Sigma, and secretary of Theta Tau. He also has an honorary membership in the American Society for Testing Materials which is awarded each year to an outstanding junior.

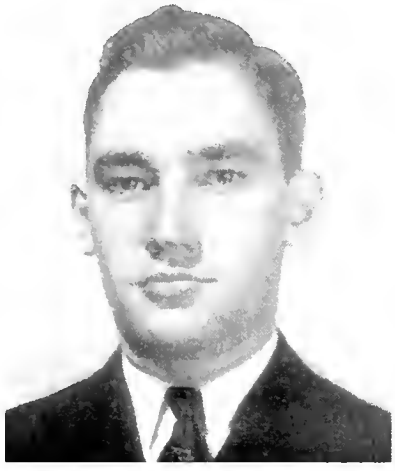
Charles Slaymaker is what is known as a "Sparkplug" in any activity that he undertakes. Although a junior in the University, Charlie is a senior in the R. O. T. C. Engineer Corps. He is a member of Scabbard and Blade, and is the secretary of the local and national chapters of Tau Nu Tau. He is a member of the A. S. C. E. and served a year on the Technograph staff. Charlie is very active in the affairs of Triangle, having served as their scholinn and as corresponding secretary. Stamp collecting once claimed his attention. Charlie's schedule calls for a Knight in Urbana several times a week. He is no longer bothered with having to change his pin from vest to vest.

Bob Johnson is another of these C.E.'s who go around getting his thumb in a lot of pies. He is quite a rifleman and this summer he was on the team sent to Camp Perry, Ohio, for the national rifle matches by the Sixth Corps Area. With the commission of captain behind him, he directs the freshmen engineers during their Saturday morning drill. He is a member of Tau Nu Tau, Scabbard and Blade, and a lieutenant in Pershing Rifles. A. S. C. E. constitutes his professional organization. As well as a militarist, he has proven himself a Thespian in the plays "Beyond the Horizon," and "Whistling in the Dark," which were put on by the Theatre Guild. Not content with these, he also has a set of numerals for tennis and fencing achievement put away in his dresser drawer. It might be of interest to note that Bob is also an Eagle Scout with the Silver Palm.

Harold Allard, an M.E. sophomore, is another of those boys who worked hard during his freshman year and made the grades for Phi Eta Sigma. Over at the Phi Kappa Psi house he takes care of the brothers' social worries and also is one of their representatives in Skull and Crescent. He is, this year, carrying out the duties of staff sergeant on Saturday mornings in the engineers' unit. Back in Pomeroy, Iowa, Harold was the valedictorian of his class and a football letterman. Lately, he seems to be worrying the Chi O's quite a good deal, or else they are worrying him—we don't exactly know which.

Dan Blum is one of the very few engineers who find time enough to participate in a varsity sport. He is a junior M.E. When wrestling practice is over each night, Dan takes care of his hash slinging duties at the Granada where he has a meal job. Dan came to Illinois from Tilden Tech in Chicago where for two years he had been city and Cook County wrestling champ in his weight. He won his numerals on the freshman wrestling team two years ago, and the Illinois wrestling fans will see a lot of him in the 118 pound class this season. Dan was taken into Palaestra, wrestling honorary society, last year.

NGINEERING WORLD •



D. D. Streid •

H. L. Hyndman, Jr. •

W. T. Hester •

WESTON HESTER started three years ago to do his bit toward proving that engineers can enjoy the more cultural things in life along with their kilns and clays, as well or possibly better than those south of Green street. Hester is a senior ceramic engineer. Accordingly, he has been singing in the University Glee Club and the University Chorus for the last three years and is furnishing his AKL brothers with their dose of good music. For his engineering contacts, Weston belongs to the Student Branch of the American Ceramics Society. He is a product of Peoria and in contrast to his musical talent, indulged in his share of athletics. He has spent the last few summers heaving ice and working with various construction outfits to keep himself in shape.

HARRY HYNDMAN, although not a regular engineer, is right in there pitching. By rights, he is a chemistry man, being enrolled in the chemistry curriculum; but he can quite well be classified along with the rest of the engineers because he was selected for the job of Lieutenant-Colonel of the R. O. T. C. Engineers Corps for this year. Along with that high honor, he is a member of Tau Nu Tau, Scabbard and Blade, and is the captain of Pershing Rifles. As a freshman and sophomore, he occupied his spare time by working on the Illio business staff. Homesickness isn't much of a worry to Harry because he lives over in Springfield.

DALE STREID is one of these M.E.'s who seem to be doing pretty well at getting his foot into a little bit of everything. He is the president of the Student Council at McKinley Foundation, a member of A. S. M. E., and takes care of the job of commissary over at the A. K. L. house. He was also made a member of Phi Eta Sigma when he was a freshman, and now has risen to the rolls of Tau Beta Pi. To round out his education, he sang in the University Glee Club for the last three years. This year he is working on a senior thesis in T. and A. M. department about the fatigue of materials. In the past summer Dale was starting out a real engineering career by trying out the contracting business. From reports, the projects didn't resolve into the red ink column of the ledger book. Now that the Ice Rink is open Dale is taking his daily dozen there.

A sophomore in mining engineering, Eugene Mauck has already won laurels for himself. Last year he won his numerals on the freshman swimming team. From these achievements, he has been pledged to the Dolphins, swimming honorary. Along with his mining work, he is helping the Mineral Industries Society to keep its coffers full by his efforts on the membership and finance committees. The past summer saw him working very industriously in a mine way down South to gain some practical experience in the mining of that area. His hobby is collecting National Geographic Magazines. He also likes to play around on Lake Danville, when he is home, with his canoe which he has equipped with a seventy-five foot sailing rig.

Richard Walker, sophomore ceramist, is another of the Phi Eta Sigma clan. He is a member of Pershing Rifles and was on the drill squad which drilled in competition at Ohio State last year. Over at the "Y" he served on the reception committee last year and is at present working on the freshman committee. Before he moved to Urbana last year, he graduated from high school in Stronghurst, Illinois, as the president and valedictorian of his class. He also won his letter in football at that school. Birds are Dick's hobby.

An unassuming and well liked M.E. senior is personified in Tom Herrick. Tom made Pi Tau Sigma in his junior year. He is also a member of his departmental society, the A. S. M. E. A good deal of his free time, if an M.E. senior can be said to have any, is spent in the activities over at McKinley Foundation. The plays put out by the Theater Guild, the Star Course, and many famous lecturers that come to our campus, furnish Tom with much fun and enjoyment. He is an independent who hails from the town of Harvey. During the summers, Tom works in a drug store to help enlarge the pocketbook that is putting him through the University. Whenever he can, Tom forgets his work in favor of his Harley-Davidson motorcycle.

Richard Beitel is a sophomore M.E. who is quite a boy. He resides in the Zeta Psi house and is one of its representatives in Skull and Crescent. Last year he was able, along with his activities, to make the required grades and was initiated into Phi Eta Sigma. He is also busy working on the editorial staff of the Illio. He is a sophomore basic engineer and last year he was one of the six freshmen who received the warrant of sergeant. Back in his home town, Moline, Illinois, he was the salutatorian and president of the senior class and also made his letters in football and basketball. For a pastime, Dick likes to show his Zeta Psi brothers just how the game of chess should be played.

North of Green Street

Students and Faculty in Many Activities

Variety of Tests in Progress at M. T. L.

Under the direction of Professor Richart, Mr. Paul Jones and Mr. T. A. Olson are working on a test of "rigid frame structures." These are the large, L-shaped pieces of re-inforced concrete that immediately catch the eye of the visitor to the Materials Testing Laboratory. They have been set up in the southeast corner of the crane bay, and during a period of more than a year a steady load will be maintained on them to determine the strain due to plastic yielding which occurs. Since the stresses tend to concentrate at the inside corner of the knee-frame, this corner is filleted, or rounded, to increase its strength. Different types of fillets and of re-inforcing are being tested. This research is being made in cooperation with the Portland Cement Company.

A series of tests on railroad car wheels are being conducted by Professor Richart, Mr. Rex Brown, and Mr. Jones. The Association of Manufacturers of Chilled Car-Wheels is the co-operative body.

Since the axle for the wheels is 0.01 inch larger in diameter than the bore of the wheel, considerable stress is produced in the wheels just by the action of mounting them on the axle. The wheels and axle unit are then subjected to forces which simulate those under actual conditions of load, rounding a curve, and crossing switch frogs, etc. Actual brake shoe tests are run to discover whether the wheel can stand the intense heating of the rim which occurs during braking.

Mr. Brown and Mr. Jones have also been comparing the strengths and elasticities of concrete for varying speed of load application. The ultimate load is applied at rates ranging from one second to several hours. Apparently a greater load may be withstood under quick application. Oscillograph records of these tests will be taken in order that the exact reaction on the material may be studied.

Mr. Lansford is in charge of the laboratory work for testing sections of 36-inch and 48-inch cast iron pipe. Any difference which may exist between pit-cast and centrifugally-cast sections will be discovered. In order that the test be made the pipe is held vertically in the large press with the ends plugged; it is then filled with water and internal hydraulic pressure is applied until failure occurs.

Faculty and Students Go to Purdue

The University of Illinois E. E. Department was well represented at the annual Great Lakes District and Student Branch A. I. E. E. meeting which was held at Purdue University, Lafayette, Indiana, October 28 and 29. Faculty members attending the convention were: E. B. Paine, Professor of Electrical Engineering and head of the department; J. T. Tykociner, professor of Electrical Engineering; E. H. Waldo, Associate professor of Electrical Engineering; H. J. Reich and H. A. Brown, assistant professors of Electrical Engineering; M. A. Faucett and H. N. Hayward, associate in Electrical Engineering. E. A. Reid, associate professor of Electrical Engineering, was unable to attend on account of illness.

Three papers were presented by members of the Illinois group. "Sweep Frequency Limits of Gaseous Discharge Tubes" was given by W. A. Depp, '36, and "A Different Method of Determining Reactive Volt-Amperes in a Three Phase, Three Wire System" by A. S. Webeck, '35. H. J. Reich spoke on "The Relaxation Inverter," and also gave a demonstration of cathode ray oscillograph apparatus. The relaxation inverter is a means by which vacuum tubes are used to convert direct current into alternating current; it was developed by Dr. Reich.

Dean Enger Welcomes Sanitation Delegates

The Central States Sewage Works Association, comprising representatives from Illinois, Indiana, Minnesota and Wisconsin, opened the eighth annual convention, October 25, at the Urbana-Lincoln Hotel. H. E. Babbitt, professor of Sanitary Engineering, was chairman of the program committee.

M. L. Enger, Dean of the Engineering College, gave the welcoming address at the banquet that evening. Professor Babbitt presented a paper, "Methods of Dosing Sewage Tanks with Ground Garbage." F. H. Whitley, graduate research assistant, gave a paper entitled "An Investigation of the Amount of Garbage which can be Digested with Sewage Sludge."

Mining Engineers Attend Institute Meeting

A. C. Callen, professor of Mining Engineering and Head of the Department, with G. M. Smith, research assistant professor, and D. R. Mitchell, assistant professor in the same department, attended a convention of the American Institute of Mining and Metallurgical Engineers in St. Louis, October 28 and 29. The main topic of discussion was recent and future developments in the coal industry.

A. I. E. E. Section Is Host

A. E. Herz, engineer of tests of the Public Service Company of Northern Illinois, was guest of honor at a dinner of the Urbana section of the American Institute of Electrical Engineers at the University Club, October 29.

That evening, Mr. Herz gave a talk illustrated by movies before a meeting of the Student Branch of the A. I. E. E. in 215 E. E. Laboratory. Three moving pictures were presented: Galloping Lines, Waukegan Power Plant, and Colored Movies of the San Diego Exposition.

New Bulletins by Experiment Station

The Engineering Experiment Station announces the following new bulletins which have been issued recently:

Bulletin No. 278—Oscillations Due to Corona Discharges on Wires Subjected to Alternating Potentials, by J. T. Tykociner, R. E. Tarpley and E. B. Paine.

Bulletin No. 279—The Resistance of Mine Timbers to the Flow of Air, as Determined by Models, by C. M. Smith.

Bulletin No. 280—The Effect of Residual Longitudinal Stresses upon the Load-carrying Capacity of Steel Columns, by W. M. Wilson and R. L. Brown.

Circular No. 21—Computation of the Pressure Exerted Upon the Soil by Various Loads, by Dr. N. M. Newmark.

Requests having continued for bulletin 13, first issued in May, 1910, it has been reprinted. The bulletin was written by Prof. E. C. Schmidt, head of the department of railway engineering, and deals with "Freight Train Resistance; Its Relation to Average Car Weight." The material is still applicable as little change has been made in cars, operating conditions, or range of operating speed.

Interesting Research Project

An investigation of fundamental importance for the knowledge of magnetic phenomena is being carried out by the Department of Electrical Engineering in cooperation with the Department of Physics. Students leaving the E. E. Laboratory through the east entrance of the basement are attracted by a large electromagnet, vacuum pumps, and other apparatus which are installed in room 108 H. Here preparations are made for a precise determination of the magnetic moment on the hydrogen atom. The revolving electron of the atom, being an electrical charge in motion, produces a magnetic field and gives to the atom the properties of a tiny bar magnet.

To enable the measurement of the moment of this magnet to be made, rays of atomic hydrogen are produced by high frequency electric discharges. By means of slits which vibrate 9000 times per second, only those atoms whose velocity equals 3000 meters per second will be selected for the experiments. Driven at this speed and subjected to the action of a strong magnet, the atomic ray will be split into two parts. By measuring the separation of the two component rays, data will be obtained which will permit the determination of the value of the so-called "magneton." A magneton represents theoretically the smallest magnet occurring in nature; the magnitude of its moment is a universal constant.

This research is being carried out by Professors J. Kunz and J. T. Tykociner, and Mr. L. P. Garner.

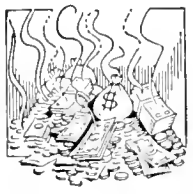
THE RIGHT ANGLE . . .

Initiative

A true engineer has in his make-up a critical point of view, an inclination to look upon unproven statements with a suspicious eye. He is unwilling to accept blindly a formula from page so and so which gives him a quick easy solution to his problem without much effort on his part. Instead, he analyzes the problem, derives a formula of his own, and if he checks the formula on page so and so, he is satisfied in his own mind that he can use it in solving future problems.

The attacking attitude is a good one. An effort is being made to develop it as highly as possible in the student of engineering courses. One of the best methods being used to achieve this end is the presentation of undergraduate thesis work. Seniors are being encouraged this year more strongly than ever before to pick a topic about which they desire to know as much as possible, and to delve into its mysteries in their own way. They are given the use of the University's laboratory facilities to help them in their work. All of these who are engaged in thesis work this year heartily approve the set-up. They feel that they are getting something out of their college course that standard curricula do not offer. These few student are perfectly right in their belief. They are substituting initiative for information, a substitution that can very well be made by all of us. Even though you stick to your regular curriculum, develop your initiative. It is the graduates with the attacking attitude of mind that are getting the better jobs today.

The world has plenty of handbook engineers who get by all right as long as the problem with which they deal can be solved by the application of a standard formula or by a table in a handbook. The "handbook engineer" is finding it increasingly difficult to keep pace with the rapidly changing engineering world. It is the man who can take the conditions of a problem and arrive at a reasonable solution even though he is far from his text or handbook, for whom the employers of engineers are looking. Don't be a handbook engineer!



Blanket Tax

How would you feel about shouldering a special assessment, payable at registration, to cover the cost of activities of the College of Engineering, in which you should voluntarily participate? Many schools have adopted this system and they have reported very favorable results. Perhaps you would pay very grudgingly at first, but as the semesters passed, you would regard the assessment as you do your tuition, something that has to be.

The matter of a "blanket tax" as the assessment is most commonly called, is a favorite topic of discussion at every convention held by organizations that depend upon the support of the student body for their successful existence. Departmental societies and college magazines lie in this group. The Engineering Council which sponsors the St. Pat's Ball in March is also one of the group. Most of the conventions spend hours arguing the matter and they generally end with the delegates thinking just as they did before.

The "blanket tax" has many good points in its favor. It insures the financial success of every student undertaking and it seems reasonable to believe that it would lead to success in other ways. Again, to sight a specific case, it has been argued that if a magazine could put all of the men of its staff who were working to increase its circulation, to improve the publication editorially, its subscribers would benefit greatly.

The Technograph has always taken the other side of the issue. It has always been our contention that if we weren't able to put out a magazine that would lead the students to subscribe to it voluntarily, we might as well quit. We believe that the student here realizes the great value that he derived by his participation in student activities. If there is question in anyone's mind as to what he will get out of joining his departmental society, subscribing to the Technograph or attending his college social functions, we refer him to his faculty or to a graduate engineer.

Slide Rule Wizards

The general south-campus impression that the engineering student is one of the wisest of nature's products is due in no little measure to the formidable appearance of the scales of the slide rule, which is such an omnipresent feature of the student's equipment. We are of the opinion that the world at large should know, somewhat, of the true ability of the carriers of the mysterious ivory-on-wood devices. The University Bookstore is cooperating in this exposure by offering an evening course in slide rule technique. This move should be highly commended, for it is giving a chance to those of nature's best who purchased a slide rule beyond their immediate needs to acquire a knowledge of the whys and wherefores of their extra scales, without the necessity of their prying it from an obscure explanation in the instruction book.

One particularly impressive scene is that of the slide rule wizard who has devised a scheme for hooking his salmon-red case to his belt, in order to be in constant readiness to whip his rule from its restful state into vivid, colorful action to estimate the value of two times three, or even two times three and one-half. We grant from experience the necessity for the presence of the slide rule among an engineer's accouterments, and similarly we recognize the utility of the leather case, but our blessing does not enfold him of the holstered rule.

It is an observation, perhaps merely coincidental, that the one who makes his rule so easy to use by swinging it at his belt, is perhaps as unaware of the value that his rule could be to him, as the mechanical engineering student is of a finite definition of entropy. Too often, we fear, the student could just as easily have been sold a Stump-Stump Twinplex as a Log-Log Duplex, for all the difference it makes in his use of the instrument. We are grateful that someone has at last sought to eliminate the futile load of excess baggage that so many engineers carry, by turning it into a useful adjunct to the mind and pencil.—A. E. S.

Departmental Societies

Groups Very Aetive

ENGINEERING COUNCIL

The engineering council is composed of the presidents of each of the engineering departmental societies, the Illinois Union representative, and the editor and business manager of the Technograph. President Rex Newcomb called the first meeting of the year shortly after school opened in September and the plans for the year were discussed. At this time, it was decided to hold an all-engineering smoker, a gathering started by last year's council. The smoker was held on October 23rd.

The council is at present formulating plans for the presentation of a class in slide rule instruction. The class, if and when it is presented, will be open to freshmen as well as upper classmen. Watch for future announcements.

The council is already discussing the problems of putting on a real St. Pat's Ball next semester. For the benefit of the new men in the college, the council wishes to say that the St. Pat's Ball is the one dance given by the Engineers and for the Engineers. Every man in the college should plan to attend. It will be held in March. It's going to be a great party.

The members of this year's council are, A. E. Bitter, C. G. Talbot, D. K. Harris, J. S. Langwill, R. Newcomb, R. H. Benedict, T. F. Scholes, G. T. Austin and W. E. Hendricksen. Faculty advisors are Prof. J. J. Doland and Prof. J. S. Crandell.

A. S. C. E.

ALBERT E. BITTER.....*President*
JOHN E. BUCK.....*Vice-President*
WINSTON BLACK.....*Secretary*
RICHARD A. JONES.....*Treasurer*

The first meeting of the year showed by its attendance the real interest of the C. E.'s in their society. So far this year the C. E.'s have presented some very interesting speakers. Mr. Charles Burdick, consulting Engineer for Alvord Howson & Co., spoke on Water Supply Engineering. Mr. Henry Riggs, former vice-president of the national A.S.C.E., spoke on the society. Mr. Robert Ridgway was next introduced to the C. E.'s. He spoke on Rapid Transit in New York City. Following Mr. Ridgway was Mr. A. Mann, assistant manager of G. E. in Chicago. Mr. Mann spoke on "What an Employer Expects of His Employee." The latest of the speakers was Prof. J. S. Crandell, who spoke on Public Works in Europe. In the future the society will present representatives from the American Steel Institute and Portland Cement Co. and promises also to have Mr. F. A. Randall, Consulting Engineer of Chicago, speak on Destruction of the Skyride Towers.

At present membership in the A.S.C.E. is about 195 and 150 of these are really active. Sixty-five per cent of the Juniors and Seniors belong to the organization, forty per cent of the Sophomores belong and fifty per cent of the Freshmen have paid the fee.

S. B. A. C. S.

R. NEWCOMB.....*President*
J. STEVENS.....*Vice-President*
W. M. TURNER.....*Sec.-Treas.*

As numbers go, the Student Branch of the American Ceramics Society is one of the smallest on the campus, but in activity, it ranks with the best. The first meeting of the year presented some of the faculty members who gave short talks to the group. The rest of the evening was divided between business and refreshments. Committees were announced and the Ceramists seem to have some fine programs ahead of them. Stan Sheldon is in charge of the programs and promises some real entertainment. The big event of the year in the ceramic school is the annual pig roast to be held some time during the second semester.

A. S. M. E.

D. K. HARRIS.....*President*
J. H. COULTER.....*Vice-President*
P. GALLAGHER.....*Secretary*
R. H. BENEDICT.....*Treasurer*

The M. E.'s have begun the year by holding three meetings and a smoker. At the first meeting they heard a representative of the Chevrolet Motor Co. who showed pictures of the 1936 Chevrolet. Mr. C. E. Davis was the principal speaker of the second meeting, a dinner meeting at the Southern Tea Room. Mr. Davis, national secretary of the A. S. M. E., talked on Engineering Developments. Mr. Abbott of the Commonwealth Edison Co. of Chicago, also spoke.

The principal speaker of the next meeting will be Mr. Jackson of the Brown and Sharpe company. The present membership of the society is about seventy. Freshmen are cordially invited to attend meetings, and those wishing to join are requested to see Professor Casberg or any of the officers.

MINERAL INDUSTRIES SOCIETY

J. S. LANGWILL.....*President*
E. J. JASINSKI.....*Vice-President*
C. L. PRUITT.....*Secretary*
J. L. BROWN.....*Treasurer*

The miners, metallurgists, and geologists get together every two weeks in 209 T. B. to hear some really interesting discussions and lectures. So far this year there have been three meetings, the first the usual social get-together accompanied by introductory remarks by the faculty, and followed by the inevitable cider and donuts. The second meeting presented three students who gave talks on summer experiences in mining and geology. The last meeting presented Mr. J. B. Morrow of the Pittsburgh Coal Co. who related a few of his experiences while engaged in the handling of coal.

The new faculty advisor of the society is Mr. H. B. Nicholson who succeeded Mr. D. R. Mitchell. The next meeting will present student talks on ferrous and non-ferrous metallurgy. The following meeting will introduce Mr. H. B. Cooley of Allen Garcia Co. of Chicago, and later Mr. F. J. Pettyjohn of the geology department at the University of Chicago will speak.

A. I. E. E.

C. G. TALBOT.....*President*
W. A. ORR.....*Vice-President*
E. A. POST.....*Secretary*
J. C. SKORCZ.....*Treasurer*

The E. E.'s certainly started the year off with a bang. President Talbot reports that the membership this year is about 200, nearly double the membership of last year. What is more, seventy-five per cent of the actives are Juniors or Seniors.

The first speaker for the Electricals was Mr. A. Herz of the Public Service Co. of Northern Illinois. Mr. Herz showed some very interesting pictures of the San Diego Exposition, and supplemented his presentation with informative remarks.

The A. I. E. E. is having the students take an active part in putting on the programs this year. The big thing on the Boneyard is the E. E. Show which will be held some time this pring. Plans are already being formulated and from the interest shown, should result in a very good show.

Campus Snapshots—

WELL, the Senior Inspection Trip has come and gone. Many of the lads had their first view of the Windy City, but to others it was an old, old story. Perhaps a book or two could be written on various events that transpired, but only a few high-points of interest will be related here. The M.E.'s seemed to sort of favor the South State Street joints. Quite a bunch of C.E.'s were noted wandering through the loop like a herd of lost sheep. Ceramists and E.E.'s must have had the best times of all, with the Railway men coming in for a very close second. The E.E.'s did very well on the free lunches Thursday and Friday at the expense of General Electric and Harnischfeger. The Minery got put up by the State Department of Mines and Minerals for two nights. 'Taint fair! We all pay taxes, and everyone else had to pay for his own lodging. The Ceramists had their own special bus from Parkhill's, and a poker game was in progress at all times. At last report, Mel Combs was leading winner. The Friday night session at Streator's Hotel Plumb was mainly a contribution to Phil, the popular bus driver. A great number of varied engineers took in the Follies at the Palace Theatre. And, fellows, weren't those gals honeys? Hot dog! Ceramists Taylor, Merle, Newcomb and Bartlett left for the North side Friday at about 11:00 P. M. Along about 4:00 in the morning, Merle and Bartlett wandered home, but the other two didn't show up until 6:30. And was there a lot of groaning on the way out to Owens Glass after the sleepless night? All groups report, "There's one (at least) in every crowd." Referring of course to the guy who asks every conceivable question of the guide when the rest of the gang is dying to get out of the damn place and start moving. Plenty of foolish questions were asked by some of these boys who are about to go out into the cold hard world and earn their salt. I'll bet Bob Cline will never send an application letter to Clark-Jewel Stove Co., for instance. Ask a Ceramics senior about that one some time.

Anyway, we saw what we had to, and everyone had a little fun, if he tried very hard, so that's that. Whether it was worth twenty or twenty-five of Dad's hard-earned bucks will probably remain a debatable question.

Your correspondent has heard of the great romance of Py Faris over at Triangle. It seems he occasionally brings a portrait of his O.A.O. to the dinner table, and eyes it lovingly throughout the meal. Try to catch him sometime when he's writing one of his tender

missives to this Missouri school teacher; and see just how love affects some guys. One more case of daily letters plus a Special on the week end. Wonder what Farley (the P. O. Farley) would do without these college romances to keep the business booming?

Listen, you engineers, this writer has received darn few contribs to this page. If you know any good dirt on any engineer, write it up and leave it with anyone who happens to be in the Technograph office at the time. Won't guarantee to run anything received, but we're pretty broadminded, so shoot 'em in.

One of the Metallurgical engineers, Len Trofft by name, also seems to have it bad. He grabs the rattler at 4:00 A. M. for Chi about every other week end—to see his folks, he says. But if you ask Len to see a picture of his Evelyn, you've let yourself in for a lengthy discourse on the particular merits and virtues of this comely damsel. Or so they say. We know nothing but what we read and hear.

There are rumors that a certain senior C.E. was slightly embarrassed the other evening when in the presence of Professor Huntington, he was asked who the head of the C.E. Department was. He answered quickly, Walter Enger.

Saw Johnny Brinkerhoff, the original woman hater, at the Park the other

evening. Will wonders never cease? What's the matter, Johnny, have a change of heart?

Our good friend, "Vin" Van Meter, is still very much interested in Bonnie Dean, the beauteous Theta. A diamond ring changed hands in August. Looks like wedding bells in the offing. Congratulations, "Vin."

Then there's Max Lamb who asked the professor in his C.E. 60 class, "The stairs here can't be very well proportioned when I fell down them twice in a row, can they?" We wonder if it happened Saturday morning.

Gene Schubert of the brass cross Schuberts pestered the editor so much about getting his picture in the Technograph, that it was finally decided to let him write an editorial. You will have to read his opinion of those animals that carry their slide rules fastened, for immediate readiness, to their belts. It's really good.

Air Conditioned Sleeping

Hot sleepless nights and cold shivery ones are to become antiquated, for the air conditioning engineer has just designed the 1936 model bed. No, streamlining was not the objective, but rather, it was the proper incorporation of air for the sleeper. By simply turning a switch, the tempearture of the bed chamber is made to differ as much as 20 degrees F. from the room temperature. Insulation is provided by a six foot screen that automatically surrounds the bed after the sleeper lies down.

Current Engineering News

Discoveries and Advancements Made

Government Plays Safe

Before the government awards contracts for the building of airships, it pursues a wary program. After the acceptance of numerous designs, an experimental contract is awarded a few chosen companies for only one of them will get the contract, the others—perhaps, the experience.

This huge Boeing bomber, weighing over 15 tons and with a wing spread of 100 ft., was considered a serious contender for a government contract until it crashed a few weeks ago. It made a world's record for sustained speed, flying 2300 miles in exactly 9 hours, an average better than 255 miles per hour. It was driven by four Hornet engines of over 700 H.P. and used a three bladed variable pitch propeller.

—*Courtesy Electrical World*

Large Boeing Bomber that was used in competition for government contract

The Tear Drop

Resembling a drop of water falling through the air, this novel construction was christened Tear Drop. The car is equipped with testing apparatus that heretofore could only be used in the laboratory. Such instruments as gas analyzers, viscosimeters, oil temperature

gauges, and blow-by meters accurately check motor performance on the road. The design reduces the load on the engine at high speeds, places the driver in intimate relation with the engine, and makes available a larger instrument compartment.

Traffic Time by Slide Rule

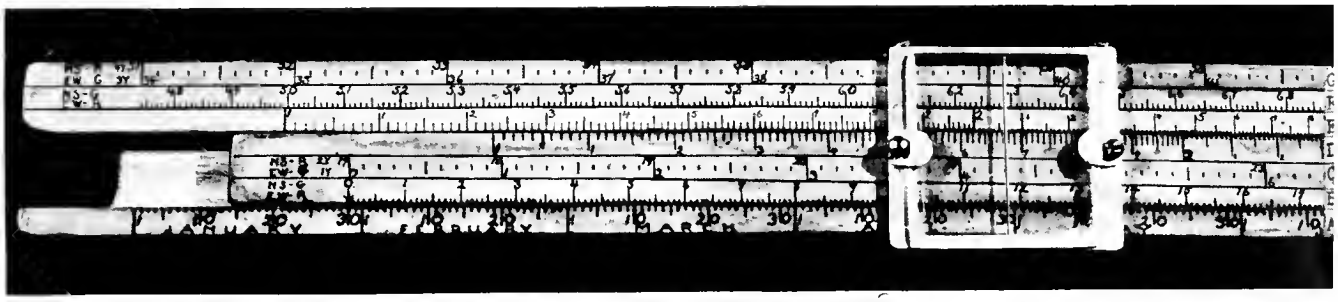
A specially designed slide rule is used to determine the actual burning hours of a traffic lamp. Each traffic unit is composed of eight lamps, red and green, facing four directions. Since there are different burning cycles used to accommodate the diverse traffic conditions, each slide rule determination is multiplied by its special cycle constant.

The life of the lamp is determined by placing the zero of the hour scale, B or C, over the date of installation, A, and the hair line over the date of failure, A. The hours are read under the hair line, using the proper scale, B or C, for the particular lamp being figured.

Largest Cantilever Bridge in the U. S. Takes Shape at San Francisco

Although overshadowed by the immensity of the twin suspension bridge of the West Bay Crossing, the cantilever bridge in the East Bay Crossing is making bridge history in the U. S. Its main span of 1400 ft. will make it the longest cantilever in the U. S. and the third longest in the world, exceeded only by the Quebec Bridge of Canada, and the Firth of Forth of Scotland. The deck will accommodate six lanes of vehicles on the upper level and three on the lower level in addition to two rapid-transit tracks. The bridge is being erected by guy derricks, and contrary to convention, will use cantilever erection through to closure; the suspended spans of the Quebec and the Forth Bridges were floated into position and hoisted.

The bridge is being constructed by the California Toll Bridge Authority as a State enterprise at the cost of $77,000,000. Construction work started in July, 1933, and will be completed by August, 1936.



—*Courtesy Scientific American*

Special Slide Rule used to determine the actual burning hours of a traffic lamp

ENGINEERING ETHICS

Prize Tau Beta Pi Essay by J. D. Taylor

TO STUDY any code of ethics we must for the moment, at least, look upon it from the viewpoint of the idealist. Were it possible for us to continue with this viewpoint any code of ethics would become a simple application of the Golden Rule. Realizing the frailty of human nature, and the fact that the code is morally no stronger than the weakest person who considers himself governed by it, we will modify our viewpoint as soon as we have formulated that set of rules, which to our idealistic sense is perfect.

We have admited above that we must take a step backward, else our scheme is not a practical one. Let us not waste our time then in formulating a set of rnles that we know are impractical and will have to be revised many times before we feel that they will become a tool to fit our hand. The American Society of Civil Engineers, in their year book of 1934, give a Code of Ethics that is a rather idealistic summation of their Code of Practice adopted in 1927. It is given as follows:

"It shall be considered unprofessional and inconsistent with honorable and dignified bearing for any member of the American Society of Civil Engineers:

1. To act for his clients in professional matters otherwise than as a faithful agent or trustee, or accept any remuneration other than his stated charges for services rendered his clients.

2. To attempt to injure falsely or maliciously, directly or indirectly, the professional reputation, prospects, or indirectly, the professional reputation, prospects, or business of another Engineer.

3. To attempt to supplant another Engineer after definite steps have been taken toward his employment.

4. To compete with another Engineer for employment on the basis of professional charges, by reducing his usual charges and in this manner attempting to underbid after being informed of the charges named by another.

5. To review the work of another Engineer for the same client, except with the knowledge or consent of such Engineer, or unless the connection of such Engineer with the work has terminated.

6. To advertise in a self-laudatory language, or in any other manner derogatory to the dignity of the Profession."

This code omits any mention of the attitude of the engineer toward the public in general, which certainly is important enough to consider. If all engineers had the same idealistic viewpoint, their interpretation of the above precepts would be identical and our task would be ended. As each engineer must intrepret the code as his moral sense directs, we must give him help.

In considering the relation between the engineer and the public let us make this statement and modify it if necessary. Engineering is a fundamental necessity to the public's welfare; furthermore, the public does not think as the engineer, hence the need for him. This places the engineer in a peculiar position and one that will, if taken advantage of, give him an outlook that is unique. The advantage is this. The engineer can think as the public thinks—must think as the public thinks if he is to be a good citizen. He then has two ways of thinking against one available to the public. It is then the duty of every engineer to accept the public duties that come to him in his capacity as a citizen, and to execute them with the same integrity that he would give to his profession. It is not worthy of anyone who calls himself an engineer to take advantage of his position to the detriment of the public.

Let us now consider the relations of engineers among themselves. In considering this point we speak of something that to us should be sacred. We look upon engineering as something more than a profession. It is a trust that is forever being enlarged and passed from generation to generation. It is something that we can look back upon with pride and a feeling that we are having a small part to play in its mighty march of progress. Let us keep some measure of this feeling as we go about in our daily dealings with our brother engineers. It will help us to build in our own minds a set of principles that will be beautiful in their simplicity and that will replace the **Code of Practice** with a multitude of personal codes that will exceed it in innumerable ways.

Much has been said and probably much will be said in the future concerning many codes of ethics. It seems to us that when we try to enumerate specific cases the code becomes a veritable monster which in time consumes itself and leaves us exactly where we started. Let us then try the simpler way.

E. C. M. A. Convention

THE Pennsylvania Triangle, engineering student publication at the University of Pennsylvania in Philadelphia, was host to the fifteenth annual convention of Engineering College Magazines Associated on October 16 and 17. E. C. M. A. is a national association of engineering college publications formed 15 years ago to standardize and improve the editorial quality of member magazines, and to help them to solicit national advertising. There are twenty-four member magazines, the names of which appear on the masthead of this issue.

Prof. J. J. Doland, faculty advisor of the Technograph, and Prof. R. W. Beckman of Iowa State College were re-elected vice-chairman of E. C. M. A., to serve on the executive board with Mr. Leonard Church of the McGraw-Hill Publishing Company.

The convention opened with a dinner meeting at Stouffer's restaurant in downtown Philadelphia on the evening of October 16. Short talks were given by the members of the executive board and by members of the assoeiation's advertising representatives, College Publishers' Representatives. A printed sheet of publishing problems facilitated the movement of the discussion.

The convention resumed discussions of advertising problems on the morning of October 17. Mr. Littell and Mr. Hoagland of College Publishers' Representatives discussed the advertising prospects for the coming year. The afternoon was taken by editorial discussion and committee reports.

The convention was brought to a close by a banquet at which the delegates heard Mr. Philip Swain, editor of the magazine "Power." A dance, dates with beautiful Pennsylvania Coeds arranged for by the Pennsylvania Triangle, climaxed the evening.

ALUMNI NOTES

1935 Class Reports Many Jobs

Civil Engineers

Newlin D. Morgan, Jr., taking grad work at Illinois.
Walter M. Enger, with the Bureau of Reclamation, Denver, Colorado.
Albert M. Levy, Metal Lath Manufacturers' Association, Chicago.
Anthony C. Repsis, Tenn. Valley Authority.
Herbert C. Zilly, U. S. Engineering Dept., Marine City, Mich.
William Sharav, U. S. District Engineers, Toledo, Ohio.
James G. Clark, State Ag College, Cornwallis, Oregon.
James E. Brissenden, Ingersoll Steel and Disc Co., New Castle, Ind.
James C. Tourek, E. J. Albrecht Co., Assist to Supt., Lockport, Ill.
B. H. Goodenough, Seth Thomas Clock Co., Thomaston, Conn.
Ramon F. Vogel, Beardsley-Piper Co., South Bend, Ind.
Ramon F. Vogel, Beardsley-Piper Co., South Bend, Ind.
Elmer Ruhnow, M. W. Kellogg Co., Texas City, Texas.

Electrical Engineers

R. E. Bailey, Teaching at Deerfield Township High School, Lake Forest, Ill.
R. E. Bodman, General Electric Co., Schenectady, N. Y.
R. H. Gehrer, Howell Electric Motors Co., Howell, Mich.
G. O. Hessler, Clough-Brengle Co., Chicago.
H. W. Horn, Grad Student at M. I. T.
M. C. Jones, R. C. A., Camden, New Jersey.
S. C. Mader, Assistant Superintendent of Schools, Morgan C., Jacksonville, Ill.
A. L. Peters, General Household Utilities Corp., Marion, Ind.
J. R. Prosek, International Harvester Refrigerating Laboratory, Chicago.
B. L. Stone, General Household Utilities Corp., Marion, Ind.
A. S. Webeck, Illinois Power and Light Co., Decatur, Ill.
R. V. Shepherd, General Electric Co., Schenectady, N. Y.

Ceramics

K. J. Bray, National Porcelain & Enamel Mfg. Co., Chicago.
R. R. Sherrill, Ferro-Enamel Co., Cleveland, Ohio.
R. J. Baker, Frigidaire, Dayton, Ohio.
W. S. Debenham, National Porcelain & Enamel Mfg. Co., Chicago.
A. E. Williams, Youngstown Pressed Steel Co., Warren, Ohio.
J. J. Theodore, Porcelain Enamel Mfg. Co., Baltimore, Md.
W. W. Coffeen, Research Assistant, Engineering Experiment Station.

Engineering Physics

H. L. Gibson, Eastman Kodak, Rochester, N. Y.
W. R. Kiltz, Dow Chemical Co., Midland, Mich.
Bruce A. King, General Electric, Schenectady, N. Y.
James A. Larsen, U. S. Bureau of Reclamation, Denver, Colo.
N. P. Millar, General Electric Co., Schenectady, N. Y.
R. C. Rutherford, grad work at Illinois.

Mechanical Engineering

Irving R. Seely, General Electric Co., Schenectady, N. Y.
Walter C. Strakosh, Eastman Kodak Co., Rochester, N. Y.
A. A. Zaphirides, Socony-Vacuum Oil Co., Athens, Greece.
Robert P. Bowditch, Carbide Carbon and Chemical Co., South Charleston, W. Va.
Carrol W. Brissenden, John Deere Tractor Co., Waterloo, Ia.
Albert E. Carlson, American Creosoting Co., Rome, N. Y.
Albert W. Fischer, General Motors Corp., Detroit, Mich.
W. R. Staggs, Naval Air Station, Pensacola, Fla.
James F. Fitzgerald, Detroit Edison Co., Detroit, Mich.
Charles K. Hedges, Caterpillar Tractor Co., Peoria, Ill.
Harvy P. Hintz, Carbide and Carbon Chemical Corp., South Charleston, W. Va.
Walter A. Johnson, Mechanical Engineering Dept., Columbia University, New York.

Railway Mechanical Engineering

George J. Lehnerer, Inspection Dept., International Harvester Co., Rock Island, Ill.
Willard O. Starr, C. B. and Q. shops, Western Avenue Terminal, Chicago.

Mining Engineering

Charles C. Boley, grad work at Illinois.
Ralph B. Jones, State Highway Dept., Springfield, Ill.

Railway Electrical Engineering

Maurice R. Eastin, Special Apprentice, Electrical Division, New York Central R. R., Harmon, N. Y.

W. M. Lansford Elected Chairman for T. & A. M. Staff

W. M. Lansford, associate in theoretical and applied mechanics, was elected chairman of the T. & A. M. faculty at their first department meeting this fall. Prof. N. H. Roy was named secretary.

Prof. Koichi Hattori, Japanese graduate of the class of 1912, gave a short talk. Professor Hattori is an instructor at Kyoka Imperial University in Japan. Several of the twenty-five staff members made reports on their summer activities. Prof. H. F. Moore attended a meeting of the American Society for Testing Materials, T. J. Dolan a meeting of the Applied Mechanics Branch of the American Society of Mechanical Engineers, and W. M. Lansford with twenty other Illinois faculty men, attended the annual meeting of the Society for the Promotion of Engineering Education held in Atlanta.

Engineers Hold Annual Smoker

Out for a carefree evening of fun, about 250 engineers assembled in the gym annex for the second annual all-engineering smoker on October 23rd. Inspired by a stinging editorial which appeared in the Illini last year ridiculing the social qualities of the boys "north of Green street," the council last year sponsored the first All-Engineering smoker. It was a tremendous success and it was decided to make the smoker an annual gathering. It was disclosed for the first time at this year's smoker, that the never to be forgotten editorial was written by an engineer.

Buck Knight, the toastmaster, started things with a bang by introducing that ever popular speaker, Captain A. G. Matthews, who carried on in his inimitable manner, on the merits of the engineering profession. His talk was enhanced by a sprinkling of specially selected engineering stories. Professor Knight stood by with a bucket of soap and water to do any purifying that he deemed necessary.

Rex Newcomb, president of the Engineering Council, introduced the other members of the Council and told of some of the plans to be carried out this year. He urged that all engineers support the Technograph and that outstanding engineering social event, The Saint Pat's Ball, in March. Pres. Newcomb conveyed the regrets of President Willard at not being able to attend the smoker because of a more pressing engagement in Chicago.

"Boss" and "Skinny" as toastmaster Knight referred to Dean Enger, explained the stresses set up in cows' legs upon landing after jumping over the moon. He answered some questions of much importance to the undergraduate engineer. One was, "What is going to become of the thousands of engineers that are being turned out of technical schools all over the country each year?" He said that in a canvass of the graduates of the past fifteen years, a surprisingly few Illinois men are unemployed at this time. He said that probably only about 20 per cent of the engineers would continue in purely technical work after graduation but that more technically trained men are being placed in the selling field than ever before. He stressed the importance of being able to meet people and to mix well socially.

An inexhaustible supply of cigarettes, lukers claimed the attention of the engineers for the remainder of the evening.

Technograph Staff

Much credit is due to a number of Technograph Staff members whose long hours were especially helpful were, Gordon Jeppesen, Ed Hong, John Sherman, Bob Cline, Bob Zaborowski, Harold Goeke, Dick Gade, Harry Skinner, Jim Stein, Gene Schubert, Ray Purl, Harry Nagle, Jim Skorez, Charles Squarey, Rex Newcomb Jr., and Jim Robertson.

Help in business matters was given by Dean Kingman, Walt Renner, and Wally Depp. Thanks to many others for fine cooperation in Technograph matters.

Development of Scientific Concrete

(Continued from Page 6)

1923 explaining their mortar-void theory of concrete proportioning. They found that the strength of concrete is dependent upon the composition of the cement paste. The application of Talbot's and Richart's method is not as simple as that of Abrams' and consequently has not gained such popularity. However, its use is spreading. The Illinois Highway Department has adopted it, and Iowa and Michigan are using a modified form of the mortar void theory. In their bulletin, the measuring of materials by weight instead of by volume as was customary was advised. Measuring by weight has only recently been generally adopted.

With improved methods of design and proportioning, concrete became increasingly popular. More men became interested in concrete. As a result, greater advances were made. So rapid has been the advancement of concrete, that when the architect first conceived the lacelike Bahai Temple in Wilmette, concrete could not be made strong enough to build it.

Indeterminate Structures Gain

The advances in the field of reinforced concrete have kept step with those made in plain concrete. Concrete structures are poured monolithically. Consequently, they are statically indeterminate. The solution of these structures offered a problem in that calculus was required. The average engineer knew little enough about statically indeterminate structures and even less about calculus. Therefore, the time involved in solving these structures proved a big factor.

It remained for Hardy Cross of this University to offer a solution to the problem. In 1929, Professor Cross gave to the world his now famous system of moment distribution. His system was so simple that in the last few years there has been a tremendous increase in the use of statically indeterminate structures.

Professor Richart's recent work with columns, slabs and walls, Professor Wilson's work with concrete arch bridges and statically indeterminate structures, and Professor Westergaard's fine work on the Boulder Dam have all done much to advance the cause of concrete.

Along with the improvements in design and proportioning came improved manufacturing. Better cement was being made, and better mixes and specifications were being produced by the engineer. But after all is said and done, concrete is only as good as the contractor on the job makes it. The engineers, realizing that a chain is only as strong as its weakest link, set about to obtain better field control of concrete. The development of field control of concrete in the last five years has enabled the engineer to obtain precisely the kind of concrete that he wants.

Field Control Developed

Field control moved the laboratory out to the job. All materials are carefully tested before being used. A sieve analysis must be made of the aggregate. The aggregate is tested for organic matter and silt. The cement must pass through sieves fine enough to hold water. Slump tests are made on the concrete after it is mixed to determine if it is of the desired consistency. Tests are sometimes applied to the wet concrete to see if it is of the specified mix. Beams and cylinders of the concrete are made to test its strength. On the more important jobs, the aggregate is often subjected to alternate freezing and thawing, and wearing tests. Soundness and strength tests are made on the cement. While pouring, the water present in the sand and gravel is determined about every half hour and a correction applied to the proportioning. With the advent of improved field control, came the vibrator. The vibrator enabled the use of drier mixes which according to Abrams' water cement ratio law meant higher strengths.

The most important improvement in field procedure has been the adoption of the measuring of materials by weight instead of by volume as suggested by Talbot and Richart in 1923. Five per cent of water mixed with the sand causes a bulking of twenty per cent. The advantage of measurement by weight is, therefore, quite obvious. With measurement by weight, greater uniformity was obtained, which, after all, is the main purpose of field control.

Hoppers Electrically Operated

Until recently, the adoption of measurement by weight was slow because the necessary equipment was expensive and untrustworthy. However, the recent improvement in equipment has been so great that at the Boulder Dam the hoppers were electrically operated. All weighing was done from a central point by simply pressing a few buttons and watching a dial.

We have followed concrete up from its infancy when good concrete was a matter of chance to its present highly scientific status. What lies in the future? Few people will dare to say. Will a shrinkless, crackless, tough concrete be produced? Looking back, who would say that this is impossible?

If this history has featured men of the University of Illinois, I offer no apologies, for as Dean Enger once said, "Wherever concrete is known, the University of Illinois is known, for in her laboratories the most outstanding and far-reaching contributions in this field of construction were evolved."

Judge (to amateur Yegg): "So they caught you with this bundle of silverware. Whom did you plunder?"

Yegg: "Two Fraternity houses, your Honor."

Judge (to Sergeant): "Call up the downtown hotels and distribute this stuff."

TECKNOKRAKS

According to a scientist the average human male is four times as strong as the female. With all due respects to the modern girl, we should say that this seems no longer necessary.

"Sharp: "You nit wit, you can't date that girl. Why, she's as beautiful as a poem."

Cary: "Poems are made by fools like me."

Doc. Howard: "I'm letting you out early today. Please go out quietly so as not to wake the other classes."

F. Masek: "That pipe of yours is quite artistic."

Leadabrand: "Yes, it draws well."

Maid: "Shall I take this little rug out and shake it?"
D. Hoke: "That's no rug; that's my roommate's towel."

"So you're on your honeymoon here at Niagara Falls. Where's the little woman?"

"Oh, I left her home."

"What? Taking your honeymoon alone?"

"Sure. Someone had to stay home and mind the baby."

Prof. (taking up quiz paper): "Why quotation marks on this paper?"

Student: "Courtesy to the man on my left."

Z. T. A.: "What's the matter, don't you love me any more?"
Bob Lange: "Sure I do, I'm only resting."

Prof. Kraehenbuehl: "Quit passing those notes."

Student in the rear: "These aren't notes, we're playing bridge."

Prof. Kraehenbuehl: "Oh, pardon me!"

E. A. Post: "Shall we sit in the parlor?"
Betty: "No, I'm too tired; let's go out and play tennis."

T. F. Pope: "Why do they have a wall around a cemetery?"

W. C. Bowers: "Why???"

T. F. Pope: "Because people are dying to get in."

Fanny: "Fella, you just can't take it."

Gallagher: "Take it, hell! I can't get it."

"Where are you going, my pretty maid?"
"There are numerous theories, Sir," said she.

Campus Cop: "Cut that out. Don't you know the deans are trying to stop necking?"

Kunzer: "You don't say. Next thing you know they'll be trying to keep the rest of us from necking."

Tom Johansen, applying for a life guard job:

Official: "Can you swim?"

Johansen: "No, but I can wade to beat hell."

"Never did like engineers," objected the sweet young Theta. "They always leave the blue prints on your neck."

Buck Knight: "Now pass all your papers to the end of the row; have a carbon sheet under each one, and I can correct all the papers at once."

Engineers Bumming Home

Pitney: "Gonna bum home?"

Jackson: "Naw, I'll get a lift with a Camel."

Dad coming to son's fraternity: "Does Ray live here."

Brothers: "Sure, carry him in."

Rock-a-by, Baby, On a tree top—
Don't you fall out—It's a helluva drop.

"An engineer got pretty fresh with me last night."

"Did you get the upper hand?"

"Yes, but I couldn't do a thing with the one he had on my knee."

THE ILLINOIS TECHNOGRAPH

Saint Pat's Issue

FEBRUARY, 1936 » » 30 CENTS

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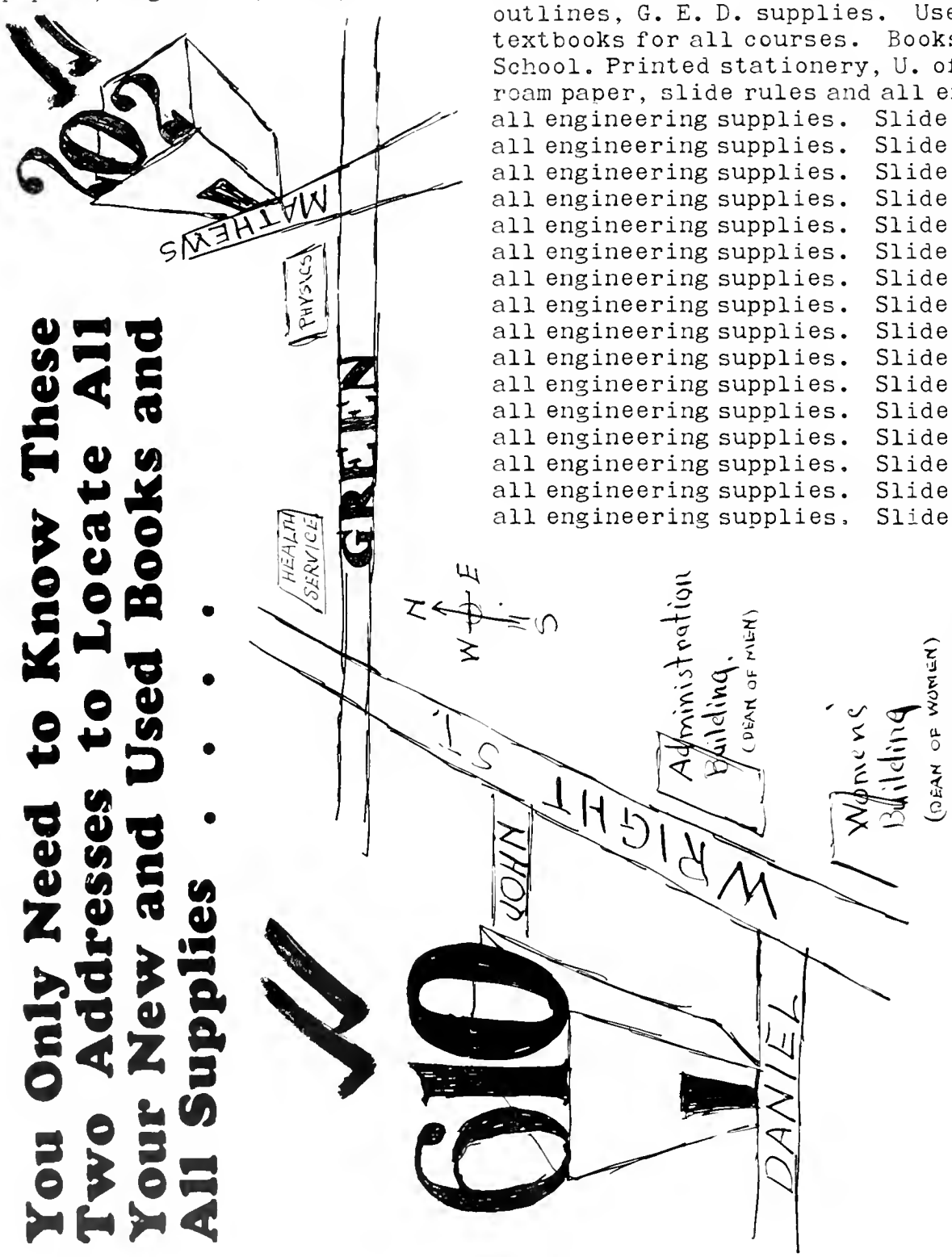
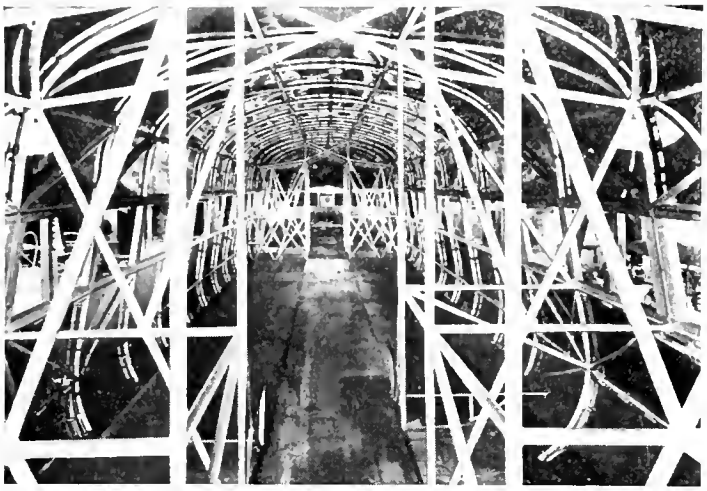




HERE'S HOW—the framework of the light weight, streamlined rail cars for high speed is Lindewelded from chrome-molybdenum steel tubing.

Mastery over all Metals

Welding Makes Jointless Structures Possible in Practically All Commercial Metals and Alloys

By A. B. KINZEL*

One great advantage of using welding is that practically every commercially available metal and alloy can be made by this means into a jointless assembly.

Contributes to Home Comforts

Numerous articles fabricated by welding are found in most homes. Familiar ones cover a wide range of metals—kitchen ware and furniture of aluminum, copper and stainless steel; copper tubing in refrigerators, sheet metal in refrigerator boxes; kitchen cabinets and gas ranges; water pipes of copper, brass, iron and steel; furnaces and hot water tanks of strong heat-resisting irons and steels. Even the tiny alloy wire elements in radio tubes are welded.

Simplifies Automobile Maintenance

Automobile manufacturers use welding for innumerable assemblies where your safety and comfort depend on permanent strength and tightness. The modern automobile repair man also uses welding. With welding he quickly restores broken parts to use again. Steel bumpers, fenders, frames are readily made jointless by welding—as strong as or stronger than the original piece. Cracked cylinder blocks and broken aluminum crank cases are welded. Valves and valve seats are made service free by welding a thin coating of Haynes Stellite to the wearing surfaces to give longer life and added thousands of low cost miles.

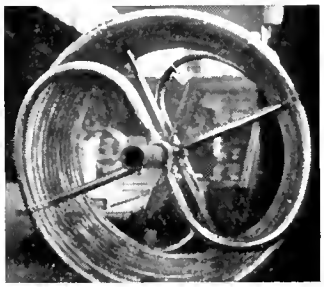
Aids Industrial Users

In industry—for tanks, containers, piping and a wide variety of other machinery and equipment of all sizes, shapes and metals—the use of welding is even more extensive.

Welding Marches Ahead

The wide-spread use of welding for various metals and alloys has been due largely to constant advances in technique and materials. Typical among these is the development of Lindewelding, a procedure for the rapid welding of steel pipe and plate. Speed increases of 50 to 65 per cent and material savings of 25 to 50 per cent over previous methods have been made.

Bronze-welding, welding with a bronze welding rod, is widely used for both repair and production. Smooth joining of metals or alloys of different compositions can be accomplished by bronze-welding. Steel can be bronze-welded to cast iron, bronze and copper can be joined, brass and steel plate can be united.



EVERY METAL—responds to the oxy-acetylene blowpipe. This stainless steel coil for cooling milk has welded joints.

Makes Modern Metal Designs Jointless

Exact procedures for the welding of corrosion-resistant steels and alloys have been developed. Welds so made are sound, strong and ductile. Resistance of the welded joint to corrosion makes it valuable also for use in joining special alloys such as Monel Metal and Everdur. Welded aluminum alloy chairs, tables and other furniture have been made possible through the development of special aluminum welding rods.

At Your Command

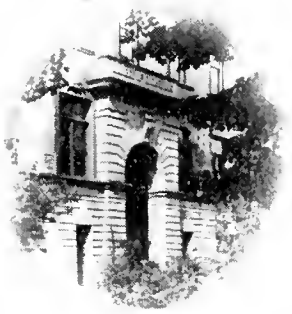
Modern welding technique, plus the great variety of metals and alloys on the market today provide many new possibilities for your products. Information

WELDING ALUMINUM—an architectural plaque, modern in design, is repaired by a modern method.

and data which will help you use welding to wider advantage may be had from the nearest Sales Office of The Linde Air Products Company, a unit of Union Carbide and Carbon Corporation. These 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 Tulsa.

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

*Chief Metallurgist, Union Carbide and Carbon Research Laboratories, Inc., Unit of Union Carbide and Carbon Corporation.



THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

FEBRUARY, 1936

Volume 50 — No. 3

THE ENGINEERS are getting ready for their annual celebration in the name of their patron saint, St. Pat. The candidates for the honor of being the student St. Pat are listed, along with general information concerning the St. Pat's ball, in the first story of this issue. We'll see you at the dance.

● Captain A. G. Matthews presents a lot of valuable tips on "Horse Sense" in a light and very readable manner in his article, "On Very Random Rubble." Those of you who know Captain Matthews will agree, after reading his story, that he is certainly "up to form." To those of you who haven't had the pleasure of meeting the captain, here is your chance to get acquainted.

● We continue to celebrate the fiftieth anniversary of the Technograph by presenting the third installment of a story unfolding the details of its long and useful life. The period from 1906 to 1918 saw a definite change in the stress given to technical articles.

● A Technograph reporter gives you the "low down" on two more prominent faculty men. Many students fail to realize that they are in daily association with men who are acknowledged masters in their fields. It is to remedy this situation that we give you this page.

● In keeping with our policy of very readable and interesting material, we bring you three editorials that we are sure you will enjoy. Gene Schubert juggles his words without a miss to inform you that engineers aren't such bad dancers after all. Gordon Jeppesen has the right idea about final examinations.

Contents

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Courtesy Mech. Eng.

Controlled Fire is One of Man's Most Valuable Aids

Engineering Council Busy Planning

St. Pat's Ball

Annual Exclusive Engineering Dance

Candidates for St. Pat Announced

REX NEWCOMB, JR.

THAT long awaited dance of dances, the annual St. Pat's Ball, will be bigger, better, and more gratifying than ever before, according to Rex Newcomb Jr., president of the Engineering Council and general chairman of the ball.

As this goes to press, plans are well under way to give the engineers the most enjoyable evening's entertainment that they have ever known. With true engineering precision, new ideas are being carefully considered and old ideas are being finely sifted to insure that everything will be presented to perfection on the night of the dance.

That St. Pat is the patron saint of all engineers was unanimously agreed upon years ago by archeologists throughout the world. It is to honor his name that engineers in schools all over the country celebrate the occasion of St. Pat's Day. Two years ago, Illini engineers attended their first St. Pat's Ball, staged partly to hurl defiance at not altogether unfounded "South of Green St." ridicule of our socialibity, but mainly to have a good time. We had a great time and demonstrated conclusively that we were not "dead from the feet up." The dance last year was one of the very best on the campus. The keen enthusiasm shown by the enginers in their support of the first two dances prompted the Engineering Council to sponsor a third informal dance this year.

Two possible dates are being considered by the committee, Saturday March 14 and Saturday, March 21. Where the dance will be held has not been definitely decided yet. Last year it was held in the Gym Annex. Dr. Watt A. Dance's almanac tells us that we will have perfect weather on each of the tentative dates. Each of the predecessors of this year's St. Pat's Ball was held while a blinding blizzard raged out-of-doors. Each was very highly successful in spite of the inclement weather.

Talbot Promises "Smooth" Orchestra

Curtis Talbot has been delegated to secure an orchestra for the evening. He has promised to bring us an orchestra that is "plenty smooth." The council recognizes that even though the setting be perfect, the best girl, the best floor, and the most congenial crowd, an orchestra that doesn't "click" can ruin the evening. Curt has several orchestras under consideration. The lucky one will be announced shortly.

Al Bitter is in charge of decorations. He and his committee have several novel and pleasing schemes up their sleeves. They claim that they can make the crane bay in M. T. L. look like the grand ballroom of Buckingham Palace. Perhaps they are a little overconfident. However, you will be sure to enjoy their work.

Crowning St. Pat

Johnny Langwill and his arrangement committee will play a very important part in the staging of the dance. They will arrange the climax of the evening, the crowning of St. Pat, the most popular engineer in the college. The identity of he who will do the crowning will be kept secret until the evening of the dance. To the reading of the traditional poem, "Erin, Go Bragh," written by Prof. J. S. Crandell and appearing elsewhere in this issue, St. Pat will be crowned. Who will he be? St. Pat is among the following representatives selected by the member societies of the Engineering Council: Bill Wheeler, Chem. E., Fritz Heinig, M. E., Winnie Black, C. E., Ed Post, E. E. Stan Sheldon, Cer. E., Gene Robertson, Min. E. One of the above men will be selected by you on the night of the dance.

Rog Benedict and George Austin state that there is to be a new deal in programs for the dance. They have announced a contest to help them select a suitable cover design. The competition is open to all university students. The student submitting the winning design will be given two complimentary tickets to the ball, the designs being judged by the Engineering Council. They must be in the Technograph office by 5:00 p. m. February 15. For further details, see any council member.

Get Tickets Early

Tom Scholes will handle the tickets. The price of the tickets had not been set as this article went to press. Last year the tickets were $1.50 per couple. Tom has an efficient corps of salesmen ready to serve you. Get your ticket early and insure yourself of admission. In the event of an unforeseen demand for tickets, the number will have to be limited to avoid crowding the dance floor.

Publicity will be in charge of Dave Harris and Bill Hendricksen. You can count on some unusual schemes blossoming forth. In the event of snow during the preceding week, St. Pat, halo and all, will take the form of a huge snowman in front of Engineering Hall.

Let the St. Pat's Ball echo from every room and corridor on the north campus. Let's put on a dance that will make the rest of the campus sit up and take notice. Only by joining wholeheartedly in the celebration in the name of our patron saint, can a man be called a true engineer.

There will be no slide rules, no corduroy trousers nor any textbooks allowed on the night of the St. Pat's Ball. Just bring yourself and your best girl, prepared for the wonderful time that you are sure to have. Let's make this, the third annual St. Pat's Ball put on by the Engineering Council, the finest dance on the campus.

He who shall be crowned St. Pat is one of the group shown above. They are, from left to right: Gene Robertson, Ed Post, Winnie Black, Fritz Heinig, and Bill Wheeler. One other candidate, Stan Sheldon, does not appear in the picture.

Military Engineer Rambles

ON VERY RANDOM RUBBLE

Dissertation by Capt. A. G. Matthews

THE engineer wanders hither and yon about the globe, altering the face of nature to accord with some obscure ideas of his own, building cities, moving rivers and mountains about the landscape, sundering the continents one from the other, harnessing the winds, the seas, and the sun to serve the little and probably very unimportant ends of human kind. From this practice of his profession, he derives much enjoyment and exercise, some satisfaction and prestige, and darn little income.

Before being permitted to embark on such a career, it has become the usual custom to require that the would-be engineer hie himself to, and serve sentence in, a school of engineering, and there be condemned to four or more years of study of the alphabet of his profession-elect. There is so much to the subject, however, that in the course of his feverish pursuit of a degree, the student of engineering is generally so concerned with the minutiate of the curriculum, the idiosyncrasies of his tutors, and the vagaries of one or more co-eds, that he has but little opportunity to familiarize himself with the fundamentals which underpin his profession-to-be. He is so occupied with learning the alphabet that he hasn't learned to read or spell; he is so busy counting the trees that he hasn't seen the forest. Consequently, to such a student, unprofitably puzzling over entropy, wall and ladder, centers of mass, or the two Lute girls, Evo and Invo, it may come as somewhat of a shock to hear some learned member of the faculty state blandly, and even somewhat smugly, that the practice of engineering is merely the application of common horse sense to the solution of problems of a certain type.

What a Man!

Nor may this statement be dismissed as just another one of those south campus cracks from the country club courses of a funny-paper faculty. It is only too true, for alas, the supposedly human brain of the undergraduate can

be taught almost anything except common sense. Most of us have seen or heard of that brilliant type, the pride of his instructors, the apple of his papa's eye, who could do triple integration in his dreams and figure riveted joints in his head, who could make indeterminate structures roll over and cry uncle, who was one swell design man, as long as he had an engineer to tell him what to design. Someone had to keep him from putting in expansion joints at Little America, or from allowing for snow loads in Jamaica. Thus, if you follow me so far, it may be apparent that the mere possession of a summa cum laude degree in engineering, of an overpowering yen to shove the Mississippi River about, and of the ability to keep track of the decimal point on a log-log, double-repeating, self-loading slip-stick does not make a qualified engineer.

As nearly as either the writer or the editor can make out, it is probably the purpose of this rambling discourse to discuss very lightly some of those underlying principles of engineering practice an appreciation of which is fundamental in making engineers out of graduated students, yet which are by nature not readily acquired in a cloistered, academic career.

Design for Needs

With occasional very puzzling exceptions, engineering works are executed in order to serve some need. Whether it be a four-holer on the plains of Kansas, or a national memorial to the name of Lincoln in the Capital, the engineer concerned with a structure has first to consider the use contemplated for his brain child. To be rather dogmatic about it, use is the primary and fundamental consideration governing and modulating all other factors in the design and construction of engineering works. Measured by this yardstick, a structure which fails to fulfill the purpose for which it was assembled from the eternal dust, is bum engineering, no matter how deftly expert its utilization of materials, how singingly beautiful its appearance, how piffling picayune its cost, or how fabulously fast its fabrication.

For example, during the late souvenir hounds' excursion to that so damp France in 1917-18, several hundred warehouses were built by the American engineers on French soil. The first few to be put up were very nice warehouses indeed, with roofs, walls, floors, doors, windows, ventilators and lights, resembling the New Gym in general type, with a conservative factor of safety of five. A brief study of the utility of these warehouses, however, indicated that they would be needed for not more than two years, and that in general the stores to be warehoused therein were but semi-perishable, requiring only to be sheltered from the permanent French rain and the non-existant French sun. Moreover, we needed all available cargo space in our ships from the states to send over ukeleles, YMCA secretaries, and home-knitted socks, so that cargo space was infinitely precious and to be conserved at all costs. From the standpoint of use, these warehouses were obviously too good, and because of the limits on the transportation of supplies, had to be re-designed. Accordingly, the next design showed these warehouses with roofs, but without floors or walls. Then some genius discovered that if they had no walls, they didn't need windows or doors. As finally approved, the warehouses in the AEF were designed with a factor of safety of from 1.75 to 2.0, and it was considered excellent engineering. Apparently then, good engineering may not always consist entirely of allowing a good fat factor of safety, nor do good engineers build heavy structures for light loads.

This latter offense against good sense almost occurred in Panama in January of 1924. The troops were out along the Atlantic coast on maneuvers, and the engineers, as always, were much in demand. A request came in from the

sector commander for the rush construction of a heavy duty truck road through six miles of cane swamp and across several deep, sluggish tidal sloughs. The mud was deep, the engineers few in number, poor in tools and materials, and up to their eyebrows in work; in short, living normal engineer lives. The sector commander was interviewed and being questioned under ether, reluctantly admitted he wanted the road to supply three thousand and sixty men he had stationed out in the jungles. When put to the torture, he screamed but ultimately confessed that the three thousand were imaginary, but they were represented by an actual sixty officers and men located within a mile of where he thought they were. After mature deliberation, the engineers put him in a splendid 20 foot, 9 inch reinforced concrete slab imaginary road, represented by a pack trail, and traveled by imaginary ten ton trucks, represented by pack mules. Everybody happy, everyone content, except the mules who reported viciously and unfavorably on their new diet of gasoline and oil and objected most strenuously to being cranked up in the mornings.

Who Has a Dollar?

Passing over this obviously selfish quibbling of the mules, the pack trail was good engineering, in that it answered all the purposes for which it had been built, yet entailed no great expenditure of either time or money. For time and money are the other two prime factors to which heavy thought must be devoted in any engineering work. A short snappy treatise on money may be obtained at any nearby bank by applying for a loan unsecured except by character. It has been wisely said that an engineer is an individual who can do with one dollar what any

diety condemned fool can do with two. This sounds as if it were probably true, but as the gentleman on the back row says, who ever saw an engineer with a dollar?

Cribbed about and constricted by the chronic poverty of our profession, we do our work on money furnished by others, and consequently, in an effort to curtail their heart-rending wails of anguish as the purse strings are nicked, we strive to keep costs to a minimum consistent with the utility of the projected structure. For instance, there were several good sized dam sites on the upper Columbia river, with a whopping big one farther down stream. If the lower site were to be developed to its practical limit, it would flood out all the smaller dam sites up stream. Due to the expense of preparation of the site and costs incident to construction, it is obviously cheaper to build one huge dam, rather than many merely good sized ones. Besides, it gives the salmon a much bigger lake to swim in.

Again, in considering the control of floods on the Mississippi, there were many plans presented, varying all the way from providing a great concrete lined flume, to the construction of quantities of impounding reservoirs on all the tributary streams. The cost of most of these projects ran into astronomical figures. The simplest and least expensive solution was adopted, that of improving the existing levee system, removing channel constrictions and providing for easy entry of the flood crest into the old natural floodways along the western margin of the valley immediate to the river.

Time Sometimes Controls

There are occasions, particularly in military engineering in the field, when time is of more importance than money. In one case, on the Pacific Coast of Panama, some thirty-five miles of road with fifteen stream crossings were to be provided in twenty-seven days by forty-four men. It wasn't as bad as it sounds, as the roads required but little work, but the stream crossings were troublesome. In some several cases, the streams could be forded easily by knocking down the banks, but where

bridges had to be built, the local standing timber was used. As a result, there was one bridge of lignum vitate, one of ebony and five of mahogany.

These examples could go on and on, but space closes in about us. In drawing this bootless dissertation to a rapid ending, let us recapitulate for a moment: Underlying the worth of every good job of engineering, there has been a careful consideration of, and correct answer to the questions: "What purpose will it serve," "When must it be completed," "How much can it cost." Until the engineer has learned to handle these fundamentals of his profession, and adjust his scheme according to their dictates, he is not a good engineer but only an engineer's stooge.

New $50,000 Mining Lab

To Be Started Here Soon

THE newest building on the campus will be the new Metallurgical laboratory of the Department of Mining and Metallurgy to be erected at a cost of approximately $50,000.00 proportioned between building and equipment, that sum having been appropriated at a recent session of the General Assembly of the State of Illinois. The new laboratory will be an independent two story brick structure 100 ft. long and 40 ft. wide. The building will be located at the east side of the present Mining laboratory, and will extend almost to the Ceramics building in a direction paralleling the present "Kiln House." Plans for the building are almost completed and work will be started as soon as favorable weather occurs, as it must be completed and equipped before the first of September of this year.

The first floor of the laboratory will house a heat treating laboratory containing gas and electric furnaces of all types, hardness, tensile, torsion and other testing apparatus. Facilities will also be provided for cutting the harder types of steel. Adjacent to the heat treating laboratory will be an assay lab which will be capable of accommodating twenty students per section. As the name implies, this laboratory will be used for the assay of gold and silver ores to determine their value. At the present time this work is being done in the Mining lab. There will also be an Electro-Metallurgical lab in which work will be done on electroplating and other phases of electrometallurgy. A feature of this part of the building will be a new type hood of a design which departs greatly from the common type hood in use in most chemical laboratories.

Process Laboratory

In conjunction with the Assay lab there will be a balance room containing analytical and assay balances which will set on extra heavy concrete piers imbedded in the ground, thus minimizing vibration. The process laboratory also on the first floor will contain high frequency electrical furnaces for high temperature work. Maximum temperatures with this type of furnace are almost unlimited, and are dependent on the temperatures that the refractories will withstand. In the same laboratory there will be facilities for work with electric and gas welding and also the less common types of welding methods.

The second floor will contain a physical metallurgy laboratory for studying, by means of a dilatometer, the expansion of metals during heating, a spectrograph for the study of metal spectra and spectrum analysis, hardness testing machines of different types, and smaller miscellaneous equipment.

Near the physical laboratory will be a classroom, two offices, and two rooms available for graduate conferences and research work. There is also a small laboratory which will probably be used for special investigations or for microscopical work in connection with ore dressing.

The Metallography lab for the study of the internal structure of a metal and its relation to the physical properties of the metal, will be the main feature of the building. The lab will accommodate twenty students per section and each man will have his own equipment including a metallurgical microscope. On one side of the room wil be an inclosed grinding room for specimen grinding containing belt and wheel type grinders, work benches and equipment for the preparation and deep etching of specimens. Tables will be provided for microscopic studies, the tables being wired so that each microscope will have its own illumination rather than group illumination which is often inconvenient. There will be six polishing machines to take up the second stage of specimen grinding or polishing, and two wheels for the final stage. Each wheel will be independent of the other wheels and will be independently driven.

Dark Room Included

Supplementary to the metallography lab will be a camera room containing four cameras. Two of these will be of the Macro type for taking pictures at low magnifications, and two Micro type for taking photographs at high magnifications. Bench space is provided for special types of equipment. Adjacent to the camera room are two dark rooms for the development of plates and one dark room for printing. The main dark room is provided with a novel entrance having no door, but which also excludes light and prevents sudden admission of light by the accidental opening of the entrance.

The erection of the new laboratory will cause some changes in the present arrangement of laboratories. Some metallurgical courses being taught in the Mining lab will be transferred to the new building, and the vacated space will be used mainly for mining laboratory courses.

Need for Trained Men

As a little of the history of metallurgy—metallography in particular—we find that the first work ever done in this country on metallography was carried on at the Illinois Steel Company of South Chicago by Albert Sauveur. In 1893 Sauveur presented a paper before the International Congress held in Chicago. His paper was a pioneer effort by an American to point the way to the metallographic control of heat treatment of metals. It is interesting to note in this connection that the metallurgical microscope was first used in the state of Illinois, and that the new Metallographic laboratory is designed and equipped with the latest developments pertaining to the science.

Laboratory and plant work creates a need for college men thoroughly trained in metallurgy. There are quite a number of schools in this country that teach metallurgy, yet the total graduates in metallurgy from all the colleges and universities in the country last year numbered only 189 men—only 189 trained men entering an industry that has given us the "Metal Age."

50-Year Old Magazine Undergoes Transition

Technograph Becomes "News Conscious"

Period from 1906 to 1918 Described

(Editor's Note: *This is the third of a series of articles recounting the history of the Illinois Technograph.*)

An index of The Technograph from from volume I up to and including volume XX, the 1906-07 issue, was included in this issue.

The first news items were published in this issue in a column headed "What Are We Doing?" Six pages were given over to news of clubs, and a write-up was given on the "Road Building Testing Laboratory."

1906-07—In 1906-07 Alvin Scholler '07 was the editor, and A. J. Schofmeyer '07 was the business manager. In keeping with the intentions to devote space to news, two pages of editorials were published. Mention was made in a short article of a half page of the coming E. E. show, and six pages were given over to "The Engineering Societies and the University," which was news items of the various societies and of the rest of the university.

Dedicated to Faculty

1907-08—The 1907-08 volume was interesting in that it was the first of three volumes which contained dedications. This volume was dedicated to W. F. M. Goss, D.Eng'g., Dean of the College of Engineering, University of Illinois. It also contained the first write-up of an E. E. show to appear in the Technograph, although the E. E. show, as an institution, was started the year before. The editor for 1907-08 was S. G. Cutler '08, and the business manager was Fred Terril '08.

1908-09—The next volume was dedicated to Prof. Breckenridge on the occasion of his retirement. The dedication read as follows: "Dedicated to Lester Paige Breckenridge, whose presence and influence has been most helpful to every engineer in the university." An article by Dean Goss praised the work of Prof. Breckenridge.

An innovation of this issue was the publication of the subjects of thesis of the candidates for graduation, with their names.

The editor and business manager of 1908-09 were B. M. Beach '09, and R. C. Wayne, Jr. '09.

1909-10—In the next volume, with I. B. Alterkruse '10 and W. W. Day '10 as editor and business manager, a dedication was made to Ernest Julius Berg, an E. E. professor. To quote from the Technograph: "Dedicated to Ernest Julius Berg, who, during the brief period since his connection with the University, has won the esteem of every engineering student, this volume of the Technograph is respectfully dedicated."

A very interesting article of this issue was "Engineering Applied to the Automobile," by D. W. Kreidler. A passage from this article shows the thoughts in the minds of the engineers of 1910. "One firm alone, proposes to build 40,000 cars in 1910. It is only a question of time before the larger portion of the delivering in the cities will be done by automobiles."

A.S.M.E. Founded

An important news item was the founding of the Student Branch of the American Society of Mechanical Engineers, in 1910.

1910-11—In 1910-1911, The Technograph became a quarterly. The Technograph Board was reorganized, with a new constitution, and it was resolved to make the magazine less technical. In the first number there were 18 pages of college notes, news of departments, and Alumni Notes.

An interesting advertisement was one for "Kodak Photography." The advertisement stated, "Every engineer should understand photography. Free course of instruction with every camera."

A news item recorded a visit of Dr. Steinmetz, the electrical wizard, to his personal friend, Dr. Berg. Dr. Steinmetz delivered two lectures, "Unexplored Fields of Engineering," and "Electrical Energy."

In 1910-11, the late Professor Goodenough, whose name is so well known in the field of thermodynamics, became advisor to The Technograph. The editor at that time was L. F. Westland, and the business manager was H. C. Krannert.

News Featured

1911-12—The first issue of 1911-12 was sixty-two pages, and twenty-three of these pages were news articles. This was the largest percentage of news items ever published. The editor in 1911-12 was H. C. Krannert, and H. W. Underhill was business manager.

1912-13—The first number of 1912-13 contained only one technical article, and the rest of the magazine was given over to news articles. The news articles concerned the E. E. Show, the C. E. inspection trip, editorials, college notes, departmental notes, thesis subjects, alumni notes, and news of research work going on in the school. Out of fifty-seven pages, only thirteen were taken up by the technical article.

The second number recorded the election of Prof. A. N. Talbot, as president of the American Society of Testing Materials.

The other numbers of that year were approximately the same. During that same year the officers were H. W. Underhill and G. G. Fornoff '13.

1913-14—In 1913-14 The Technograph returned to the text book size. In the second number an article was written on "The Mechanics of the Gyroscope," by Fred B. Seely, then an instructor in Theoretical and Applied Mechanics.

The frontispiece was a picture of a banquet room, with the caption, "Dinner and reception for Prof. Ira Osborne Baker '74, commemorating 40 years of active and continuous service on the faculty of the University of Illinois."

The editor for the year of 1913-14 was R. V. Waller '16, and M. Ruskin '16 was business manager.

1914-15—The second number of 1914-15 was a "Safety" issue and all articles printed pertained to safety in industry. None of the articles were written by students. The editor was R. V. Waller '16, and M. Ruskin '16 was business manager, both men serving for their second year.

1915-16—In 1915-1916, The Technograph was given over to describing the foundry. It contained several pictures of the building and machinery, and an article was written for it by Mr. R. E. Kennedy.

—Courtesy Alumni News.

Graduation Procession of the Class of 1913

The editor for 1915-1916 was R. R. Thomas '16 and P. W. Freark '16.

1916-17—The 1916-1917 issues took a sudden turn to poetry. Some of the poems published were, "The Golden Legend" by Longfellow, "The Big Men," by Walt Mason, "If," by Rudyard Kipling. Another poem was "The Grey Iron Casting," by J. H. Hague, instructor in foundry practice. The best poem was "The Mathematician in Love," by Professor Rankin, which shows some of the lighter thoughts of the well known mathematician.

1917-18—The editor and business manager for 1917-1918, as well as 1916-1917, were C. B. Taylor '18, and F. L. Shankwiler '18.

In 1917-1918, there was only one issue of The Technograph, a fact which mended the forthcoming discontinuance of the paper. But this issue contained many interesting articles. It recorded the election of Prof. A. N. Talbot to the presidency of the American Society of Civil Engineers, and contained a tribute to Prof. G. A. Goodenough by Dean Richards. Two very interesting articles in this issue were "Electrically controlled Steam in Automotive Field," by M. J. Hammers '89, Sec'y-Treasurer of Doble Detroit Steam Car Co., and "Radio Telegraphy" by Glenn Koehler.

Railway Club Sponsors Lecture

All students and faculty members of the engineering college were invited to attend a lecture on the "Nosing of Railroad Car Trucks" which was given in room 215, E. E. Lab., the evening of January 14.

Under the auspices of the Railway Club, Mr. H. A. Otis, engineer of car equipment of the Chicago Rapid Transit Company, gave a description of experiments made under his direction on the Chicago, North Shore and Milwaukee Railroad to determine the cause of the nosing of trucks under high speed interurban cars.

"Nosing" is merely the rapid horizontal vibration of the trucks; it communicates to the car body vibrations which at times may become very annoying to the passengers.

Study of the condition was made by means of high speed motion picture cameras; Mr. Otis exhibited films to illustrate his lecture. Information obtained from his work led to the adoption of wheels with cylindrical instead of conical contours, and consequent correction of the nosing.

Mr. Otis is a graduate of the class of 1912 in electrical engineering from the University of Illinois.

Mr. Chu Hits Pipe Exam

Goes to E. E. Show

CHU smacks studies in well known examination for goal like horse shoe game—close count is nothing in some position. Now, with new score board for 2 semester, and burning prayer papers at both ends hope for high A to Z record.

Cannot restrain self from enjoy thoughts of fine marks and happy faculty when Chu bring snappy answer for all question and hand in papers johnny on dot each and all occasion. Very fine extend these courtesy to amiable professor. Students fail appreciate noble persons giving out large handouts at relief station of knowledge.

Chu lean back in torture chair reserved for student roomer and meditate upon firm resolve crack down on studies, be A-1 house boy for wig wag chores. Feel like Mun Arch of all Survey. Lay books, papers to side for brief moment. Glad to take up hard work soon; nothing Chu like better; hard work test metal—Chu metal now ready for big resistance.

Students All Ajog

This is great year at U. of Ill. Great year for mighty engineer student body. Whole place ajog for St. Pat dance. Must take classy number same party. Have happy hope import new and fancy girl friend from ancient city of Danville. Wonder how China girl of this community like idea Chu import rich and beautiful heiress crossing county line? Meet Danville daughter of idol rich merchant at amusement park that city; perhaps Hon father and mother there receive Chu very soon at palatial home described by daughter.

But time is on fly. Chu must rise, dash off, or miss Prevue of famous E. E. show. Prevue given tonight for famous members of Gen. Committee. Glad to employ humble talents to help make show great success. This Prevue much of honor like Hollywood famous first, or season ticket to see Cubs, or complimentary pass to dress rehearsal of faculty player's club.

Where Men are Men

Half-size vest burst with pride as Chu leave behind small change of romance plans. Electrical Engineer Show strong stuff. Men play at E. E. game; not women and small fry—all ok for come and look, ask silly question, but real work of show for better class men only. Find same true on reaching E. E. Bldg. and finding all lit up—show already square of 10 percent better than last time.

Committee men very busy. Very important. Many new ideas. Students showing professors latest crinkles in garbo speech, happy electrocution, see nothing tell-all television newspaper, lightning bug semaphor, perpetual emotion machine, slip stick for Dickinson rating system, he ejector, three dimension blackboard for demonstrations student body in natural colors, horse with two heads, large charge account of electricity, hall of mirrors, and other circus phenomen same as believe it or weep. E. E. show of 1936 way ahead of century. Take a long time for world to catch on.

Chu and Co. on Tour

Chu walk along time down old time streets; see all new places like special world's fair. How about Hon reader this article take personal conductor tour with Chu, member of Gen. committee? Put on badge, come along. Walk important like big shot—nobody ever recognize same.

Things very spooky. Chu and Co. go around E. E. lab, find student busy. See sign on room say "Delayed Speech Apparatus," Chu push switch and button and apparatus move; Co. sit down and wait for delayed speech, but delay too permanent result zero. Apparatus no good. Chu and Co. walk out; soon voices come repeat Chu speech.

Chu and Co. digress to next room and sign say "Scrambled Speech." Co. talk thru microphone and speech return unintelligible. Chu think, "Here chance to get even." Chu swear at apparatus in Chinese, but speech unscramble and come out English. Very bad in English, so leave room as fast as dogs permit.

Leave in Hurry

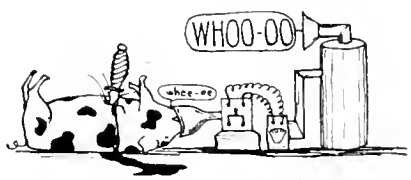
Chu and Co. pour out frying pan into baptism of fire, for in the next room see student play with electricity. Hair depart from neck to see spark come from finger nails of student. Then Chu and Co. observe catch fire on students elbow. Last limit of all when student make electric light bulb burn omitting wires. Current for this, friend tell Chu, enough to kill person. Chu believe student devil. Conductor and Co. leave room in twinkling of eye ball.

See radio station and Hon. Ray Kempf, prop. Ask Ray send message home for Chu saying Chu not well and send money. Ray open code book and send message. Then first ass't come over and say, "Hey, Kempf, what's matter you, you use wrong code. That code for Season's Greeting. You sure make good operator." Chu say, "Never mind, same result. Chinese New Year come in couple Weeks."

Chu come entrance and door open by self. Very clever, and Chu eat scientific breakfast of electrified hot dogs. Hot dog too hot, so Chu seek drink water. Stoop over fountain and water come out automatic, sock same in eye, remarkable indeedy.

Mechanical Rabbit

At last find scientific guide. This mechanical rabbit look very grotesque and walk, talk, smoke and do things like human being, but same all cooked up by man. He escort Chu and Co. around and demonstrate fancy brands of lightning. Big blue flame streak across room, noise like machine gun: great improvement over real thing. Soon go



The Pig Squeal Amplifier (Patented)

see other apparatus and tune in on heart-beat; also seen on florescent screen, skeleton of Hon. reader in person.

Many other marvel ready for access. Chu and Co. lose way looking for homemade rainstorm. Chu fall heavily to floor, leviate self to see, not E. E. show, but student in room with torture chair at side, and books and good resolutions nearby. Chu perhaps fall asleep and dream of great E. E. show coming soon.

Too bad books get go by. Pretty late now. But tomorrow Chu sure to start on noble study career.

Hoping you are same,

Khan Chu '37.

Interesting Faculty Facts

Uncovered by Technograph Interviews

Prof. O. A. Leutwiler

Professor Leutwiler first saw the light of day not far from what was to be the scene of his future stamping ground. He was born in Highland, Illinois, in the late seventies. He attended the public schools in Highland, and then, after substituting one year in the University preparatory school for the usual high school period, he entered the University of Illinois in the fall of '95. After graduating in '99, he was given a fellowship for the year 1899-1900 and obtained his M. E. degree at the end of that time.

For the next year he worked for the Parlin-Orendorff Company in Canton, Illinois, manufacturers of agricultural machinery. From the fall of 1901 until the summer of 1903 Professor Leutwiler was at Lehigh University as an instructor in mechanical engineering. In the fall of 1903, he came back to the fold, joining the staff of the University of Illinois as an assistant professor of machine design. Since then he has steadily advanced in the department. He became in turn a professor of machine design and a professor of mechanical engineering design and since July 1934 has been head of the Department of Mechanical engineering.

Many Memberships

Professor Leutwiler's memberships are many. He is a member of the A. S. M. E., the S. A. E., the American Gear Manufacturers Association, and the S. P. E. E. He is also a member of Tau Beta Pi, Sigma Xi, Pi Tau Sigma, Sigma Iota Epsilon (commerce efficiency fraternity) and a charter member of Sigma Alpha Epsilon. He is a member of the American Standards Committee of the A. S. M. E. and represents the A. S. M. E. on the Washington Awards Committee of the Western Society of Engineers. As for his University connections, the professor is a member of the Illini Board of Control and was until a year ago a member of the Union Board.

The professor has a number of texts to his credit. Among these are "Machine Design," "Problems in Machine Design," "Notes on Mechanics of Machinery," "Notes on Hoisting and Hydraulic Machinery" (as a second volume of the above), and "Design of Steam Power Plants."

Places Graduates

In answer to a query as to the reason for his well-known success in placing graduates with engineering concerns, the professor merely laughed and said, "The department was quite fortunate last June in placing men." Upon further questioning, however, the professor explained the painstaking efforts he makes to secure positions for his seniors. First, all graduates are carefully kept track of, together with the concerns which employ them and the persons in those concerns whom should be contacted. A double file of this material is kept; one file of the graduates, one of the concerns. Classes back to that of 1922 have been canvassed to make these files more complete. A second important part of the plan is the organization of the graduating class. A secretary is chosen, and once a year he writes to the members of his class asking them to write him telling of their positions and activities. The letters thus received are duplicated in quantity, bound, and a copy of the complete class letter sent to each class member.

Thorough and Neat

An example of the thoroughness of the methods used is the fact that last June, when it appeared there would not be enough positions available, Professor Leutwiler wrote to sixty-five firms and from these obtained sufficient leads to give every man a chance—and nearly every one was employed.

Prof. O. A. Leutwiler

The professor likes to indulge in baseball and golf, particularly the latter in recent years; likes to drive on the open road; keeps a very orderly office; is very liberal with his time to students, and decidedly has a sense of humor, with an engaging smile to put it across.

●

Prof. C. M. Smith

Professor Smith is strictly a home town product, having spent his boyhood in the twin cities. He graduated from the Champaign high school in 1915, and registered that fall in Municipal and Sanitary engineering. In 1917 he was seized by the war fever and joined the navy. For the next twenty-two months, as a member of the medical corps, he faced germs more deadly than the German torpedoes, working with infectious and contagious diseases.

By the time the Armistice was signed his supply of patriotism ran low, so in 1919 he left the navy and returned to college. This time, however, he registered in mining, and finding nothing as diverting as a war, continued without interruption until his graduation in 1920.

Returns to Illinois

In June 1920 he was employed by the Anaconda Copper Company as a technical assistant in the research department. At the time, a process was being developed by the company for extracting aluminum from clay. The process was worked out, but was abandoned because the cost proved prohibitive. As a result, Mr. Smith, along with others, found himself forced to move. The next fall he was back in the old home town and, further, on the staff of the University as an assistant in the Department of Mining engineering. Until 1926 he taught mine surveying, ventilation, and utilization of fuels. During the summers he spent his time in several mines in West Virginia, Illinois ,and Missouri, or in geological work which took him from Ontario to Alabama. Since 1926 he has held a research appointment in the Engineering Experiment station, and has spent most of his time investigating ventilation of coal mines, friability (breakability, to non-miners) of coal, the utilization of mine waste, and certain features of mining safety.

Likes Sports

His memberships include Tau Beta Pi and Sigma Xi. He enjoys skating, billiards, and hiking; likes baseball and football; liked wrestling before it was speeded up, an hour to a fall being more like the real stuff, in his estimation, than today's fast game; his pet peeve is a dial telephone.

He has been author or joint-author of numerous Engineering Experiment station bulletins, and has written several other technical articles.

The professor was reluctant to launch into a monologue about himself, but finally was persuaded to do so. When he did, he spoke so interestingly that any attempts on the recorder's part to improve on the material were promptly relegated to the junk heap. Professor Smith certainly has no desire for publicity, scarcely caring if his full quota of honoraries and the rest were recorded. However, he did get in the spirit of things to the extent of mentioning, without solicitation, that he is married and has a daughter.

Members of Faculty Attend Meeting in New York

Five members of the College of Engineering faculty attended the annual meeting of the A. S. C. E. which was held in New York City January 15 to 17.

Those members who attended were: Whitney C. Huntington, professor of civil engineering and head of the department; Arthur N. Talbot, professor-emeritus of municipal and sanitary engineering; Hardy Cross, professor of structural engineering; Wilbur M. Wilson, professor of structural engineering; and Jamison Vawter, professor of civil engineering.

American Society for Metals Honors Three Junior Men

Lowell McCreery '37, Harlan Oehler '37, and Robert Richmond '37 have been awarded honorary student memberships in the American Society for Metals by the Chicago chapter. All three are taking courses in metallurgical engineering.

The society each year gives the memberships to students in the department of mining and metallurgical engineering who meet the requirements of the organization. Students granted the honor must be exceptional in work in metallurgy.

North of Green Street

Seek Methods of Removing Sulphur Dioxide from Flue Gases

H. F. Johnstone, assistant professor of Chemical Engineering, is in charge of research work which is being carried on at the University for finding ways to remove sulphur dioxide from the flue gases of industrial power plants. Experiments are being made in cooperation with the Utilities Research Committee of Chicago.

Even in a comparatively small plant such as the one here at the University, the amount of sulphur dioxide in the flue gas may be several tons daily. When oxidized to sulphuric acid, this may have bad effects such as the causing of deterioration of clothing, curtains, house paint, etc., in the nearby territory.

The object of this investigation is to discover means of removing most of the sulphur dioxide at a cost which is low enough to permit practical application of it in industry.

Professor Johnstone states that there are already five patent applications on this subject which are a direct result of work done at the University of Illinois.

New Officers of A. S. M. E.

A new set of officers to head the American Society of Mechanical Engineers was elected at a recent meeting of the society. W. S. Davies and F. Thielman were chosen to take charge of the publicity committee for the second semester. The new officers are:

R. T. Lee_____President
R. H. Benedict_____Vice-President
L. H. Collison_____Secretary
F. C. Heinig_____Treasurer

C. E. Calvin, representative from the Ethyl Gasoline Corporation presented a talk on "The Anti-knock Qualities of Tetra-ethyl Lead Gasoline" before an enthusiastic gathering of mechanical engineering students and faculty on January 8, 1936. A small one-cylinder motor was used to demonstrate the contrasting performances of the engine when run first on common gasoline and secondly on Tetra-ethyl Lead gasoline.

Students are busily engaged in preparing papers to be presented at future meetings of the society. The writer of the paper that is judged best of those presented, will be sent to Chicago in April to a district meeting of the parent society, to present his paper in competition with the representatives from other Midwestern colleges. A twenty-five dollar prize will be awarded to the winner.

A. S. C. E. Holds Election

After an enthusiastic campaign which began with the nomination of candidates on December 11, the C. E.'s met on January 8 and elected to office for the coming semester the following men:

W. E. Black_____President
E. G. Robbins_____Vice-President
T. F. Pope_____Secretary
T. B. Sear_____Treasurer

At a special meeting held on December 18, the C. E.'s chose W. E. Black as their candidate for St. Pat.

Among the speakers who came to talk to the student chapter during the latter part of the first semester were Mr. E. J. Noonan, consulting engineer for the Chicago Committee on Railway Terminals, and Mr. Henry Penn of the American Institute of Steel Construction. Mr. Noonan told of his experiences in railway location back in the days when the railway construction boom was still at its height. Mr. Penn discussed the importance of fireproofing in present day construction and outlined the design and some of the modern methods of construction of fireproofing. Mr. Penn is a graduate of Illinois and was a classmate of Dean Enger.

For the coming semester the C. E.'s are looking forward to meeting and hearing as speakers two men from the Portland Cement Association, Mr. Frank T. Sheets, consulting engineer, and Mr. H. F. Gonnerman, manager of the laboratory; Mr. Frank A. Randall, structural engineer of Chicago; and Mr. D. J. Brumley of the Illinois Central railway.

Atom Smasher Nears Completion in Physics Building

A huge 7-ton electromagnet has been set up in the Physics building, and early this spring it may be used for such amazing work as making common table salt radio-active.

The "cyclotron," as the apparatus is properly called, was developed by Prof. E. O. Lawrence of the University of California. The unit here on the campus is being constructed by Professor P. G. Kruger of the department of physics, and his assistant, Mr. G. K. Green.

Professor Kruger spent the summer in California studying under Professor Lawrence, and the local instrument will be constructed along the principles which Lawrence established.

Between the pole faces of the magnet, which are sixteen inches in diameter, is located a heavy brass box of the same size and about six inches deep. In this box a high vacuum may be created, and atomic particles of various kinds may be accelerated in a spiral path, then shot out into a container which holds the material to be bombarded. The speed of the particles in the beam will approach 4000 miles per second.

Energy for accelerating the beam will come from a pair of water-cooled radio frequency oscillator tubes. The intense magnetic field holds the particles in a spiral path until they have acquired an enormous kinetic energy.

Those persons who are not technically inclined will nevertheless be impressed by the strength of this electromagnet. Its field will be more than 20,000 times as powerful as that of the earth. It is wound with two miles of insulated copper tubing about one-fourth of an inch in diameter. Copper tubing must be used instead of solid wire in order that water may be circulated through it to keep it cool and prevent the burning up of the insulation. Two hundred amperes direct current will flow through the winding, and in a space about equal to that occupied by two large motor truck tires, as much head will be generated as by fifty common electric toasters!

The cyclotron is a recent development in apparatus for disintegration experiments, and it is hoped that it will yield new information about the structure of the core of the atom. With it some elements may be changed into other elements which stand lower in the atomic table. It cannot make gold from lead, however.

Common table salt (and various other substances) may be treated with rays from the cyclotron and given some of the properties of radium, to provide a cheaper method for the fighting of cancer. This radio-activity property of the treated salt may be made to last any desired length of time from several hours to several months. In one way it will be more valuable than radium, for it may be injected directly into the diseased tissue; after a short while it will become inactive, but radium continues to give off the rays and would in time cause deterioration of bones and of healthy tissue.

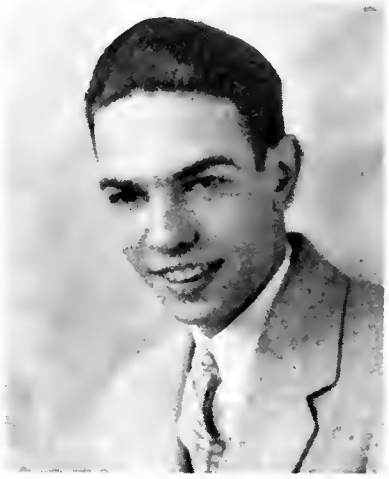
The machine will be operated entirely by remote control because of the possibly dangerous effects on the human body of the particles and radiation created by the cyclotron.

Professor Kruger expects to have the unit operating sometime before the end of this winter.

• WHO'S WHO IN ILLIN

• *John Langwill*

• *Elbert Carter*



• *Gordon Jeppesen*

JOHN LANGWILL '36 is starting out as a digger in a big way—not a gold-digger, such as the campus co-eds—he's going to be a copper miner down in the British province of Northern Rhodesia at the Rhone Antelope mine next year. Up until last year, John was one of the "Lay Around and Sleep" students at North-
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eft of his spare
chool, while the late summer and early fall were occupied in learning the physics of the microscopical technician business in a canning factory. El is an accomplished cellist, having played in the University Orchestra during his sophomore and junior years. As an N. Y. A. project, he is working in the dairy chemistry department on research in photo-electric calorimetry. Waiting tables at the Alpha Gamma house literally brings home the bacon for him.

GORDON JEPPESEN '36 is an example of an engineer who has found the perfect blend of school work and extra-curricular activities. Perhaps his efficient time budgeting system has something to do with it. Gordon has one of the highest scholastic averages in the College of Engineering. Phi Kappa Phi and Tau Beta Pi have recognized his ability and have placed him on their roll of members. Gordy is corresponding secretary of the Tau Bates. He has been very active in the affairs of the A. S. C. E. for the last two years. At present he is chairman of their program committee. Gordon's editorial masterpieces are certainly a big help to the over-worked editor of the Technograph. Although managing a track team crowds his time too much, he still finds time to help the regular managers during the practices. During the meets, he and his twin brother, Norman, act as score keepers. Canoeing and tennis help to pass the afternoons at home in Joliet, while intramural baseball and basketball help to keep him in trim while he studies in Chambana.

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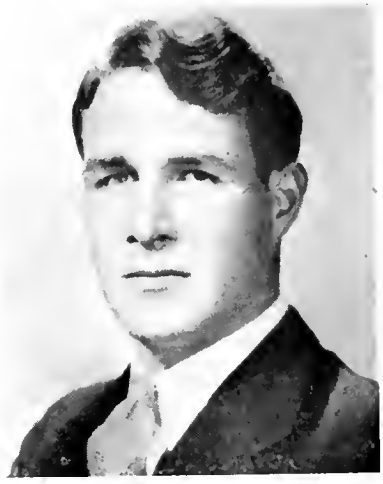
novel distinction of being the smallest officer in the Advanced Corps. He is a second lieutenant in the signal corps and a member of Scabbard and Blade. His hobbies are photography and radio.

Fred Marich came from way down in New Mexico to study railway mechanical engineering at the University of Illinois. In connection with his chosen profession, Fred has secured an N. Y. A. job in the Railway Engineering lab where he helps in testing brake shoes, car wheels and other train equipment. He ordinarily spends his summers working in coal mines. Next summer will necessarily be spent at camp with the Military Engineers for he has enrolled in the R. O. T. C. Advanced Corps. Lieutenant Marich is a member of Tau Nu Tau, honorary military engineering fraternity. He evidently likes to wander aimlessly about, for when the season opens, Fred intends to take up golf.

Robert E. Burns, no connection with cigars, is an electrical engineer in the class of '37. Having been raised in a mining town, Galena, Illinois, Bob had ambitions of becoming a great mining engineer. With this in mind, he enrolled in the Wisconsin School of Mines. Two years in mining convinced him that he ought to be an electrical engineer, and so now he is well on his way. He keeps in touch with his engineering work during the summer by working for the State Highway Department. Bob expects to attain scholastic honors next year and also to branch out into activities.

ENGINEERING WORLD •



Tom Scholes •

Wallace Depp •

John Luce •

JOHN LUCE '36 is another of those Chicago lads about whom the home folks read, "Local Boy Makes Good." As an M. E., he is of course a member of the A. S. M. E. and the American Society of Metals. Phi Kappa Phi, and Tau Beta Pi have also placed him on the annals of their respective organizations. Pi Tau Sigma evidently trusts him to the utmost, because it is he who juggles their money bags for them. When he gets out of school, John plans to get into machine design work, but so far his experience has been mainly with life guard work—you know, getting to meet the prettiest girl on the beach by pulling her out of the briny deep! Before Illinois claimed him last year, he attended Armour Institute of Technology where he won his "A" in swimming. Professor Moore is taking John under his wing in M. T. L. on some research concerning the fatigue of metals.

WALLACE DEPP '36 is an E. E. who is starting out as an electrician of the first order. Especially since Arrowsmith, Illinois is a small town, the folks all know him as the home boy who is going out into the world and making a name for himself. At the meetings of Tau Beta Pi, Phi Kappa Phi, Sigma Xi, Synton, and the A. I. E. E. he helps to add a little pep while the Eta Kappa Nu's burden him with the responsibility for their fiancial condition. Still along a business line, he exerts his energy towards the Technograph's problems. Next year, instead of leaving so soon for the cold, cold, world, he is planning to do graduate work specializing in electronics and radio. Anyone can easily imagine that radio is one of Wally's chief hobbies—and also a source of revenue during the summer vacation. A tug on the end of a fish line furnishes him with relaxing excitement when a troublesome circuit gets a little too complicated. In the electrical show which the E. E.'s are going to put on, he is chief engineer.

TOM SCHOLES '36 has gotten his fingers in so many pies since he arrived from Springfield Junior College in his sophomore year, that we are only able to very lightly touch on his activities here. His work in Civil Engineering has been good enough to satisfy the high standards of Chi Epsilon of which he is vice-president. Membership on the Union Board of Directors gained for him a seat on the Engineering Council and the latter organization has elected him secretary-Treasurer. Last year he was president of Mu San. Being a big fellow, football attracted him. He soon found out that football and engineering don't mix any too well and so he confined his talent in athletics to the interscholastic circus in which he performs as an aerial gymnast. He is also an examiner in the Red Cross Life Saving Corps. Corner Tom at the Triangle house where he eats, sleeps a little, and starts out on dates, and make him tell you some of his interesting experiences as a cable-spinner on the new San Francisco-Oakland Bay Bridge last summer.

When we come to Freddie Linn, we meet up with a young E. E. who certainly can make the sparks fly—in more ways than one, too! At the Sig Pi house, as house manager, he keeps things in repair along with his duties on the Executive Council. Last year he located station W9NZF in the basement of the house and this year is the president of Synton. He also is a member of the American Radio Relay League, Pi Tau Pi Sigma, Phalanx, and is a second lieutenant in the signal corps unit of the R. O. T. C. Last summer he worked for a while painting houses in Chicago, and then departed to upper Michigan where he built a small sailboat for a pastime. While attending Schurz High School in Chicago, he was a member of the swimming team. Now his excess energy goes for intramural sports.

Capable, quick-witted, and of pleasing personality are words that describe Bob Jordan, junior general engineer from Chicago. His husky frame was developed by summer work in the past few years, playing with steel in the mills of Gary. He has spent a little of his time in using his brawn to advantage in wrestling. He was a member of the freshman wrestling team, the A. S. C. E. and Scabbard and Blade boast him as a member. Bob is a lieutenant in the Advanced Engineer Corps. At Camp Custer last summer, his quick-witted humor kept the rest of the boys laughing most of the time. He has a good line; is a member of Mu Pi Sigma. Bob is an officer in his social fraternity, Phi Kappa Tau.

One of the most capable of the junior civil engineers in the College of Engineering (courtesy, Aledo Times-Record) is Harry Skinner. Harry has one of the highest averages in the College at the present time. At the end of his sophomore year, he had the highest scholastic average among the sophomore C. E.'s and as a result was given the Chi Epsilon Scholarship Key. Harry confines by no means all of his time to studying. An N. Y. A. job under Prof. E. E. Bauer took care of part of his spare time last semester. He also devotes quite a bit of time to the many organizations to which he belongs. Harry is a member of Chi Epsilon, Tau Nu Tau, A. S. C. E., and the Technograph staff. His hobbies are wrestling, baseball, and raisinell over at the Triangle house.

Campus Snapshots —

Here sits your Campus Snaps Editor in the deepest quandry of his reportorial career, if you don't care what you say. Last issue, we made what we thought to be a sufficiently impassioned appeal to you readers for contributions, bits of dirt, scandal, pranks, quips or what you will of these popular engineers. The net result was a totally barren contribution box. Not even one stale joke have we to start with this time. Therefore, whatever follows will have to be made up on the spur of the moment; and the principles of strict truth may not be rigidly adhered to. If you don't like it, you'd better help out a little.

Dorothy Segur has one swell time, being the only femme in E. E. 61 laboratory. She has successfully connived to hold down the recorder's job each week, so that the male of the species is inveigled into doing the mental (and most of the manual) labor. This business of being a weak, defenseless woman has its points, eh Dorothy?

Ed Dietterle reports a great time in Chicago at New Year's. We understand Eddie has one of those 36 hour dates. That's what we call real endurance.

When it comes to true versatility, we take off our hat to Tom Scholes. After dating interludes with Mathilda Simpson, Tri-Delt, and Bobbie Elvis, Alpha Chi Omega, two of the distinctly larger women on campus, Tom begins to run around with petit Blanche Merrill, Alpha Xi Delta pledge and incidentally one of the better Frosh. Maybe sometime he'll date up with Miss Average Co-ed, but it doesn't seem likely at the present.

Because his gal in De Kalb has cut down her postage from six to four letters a week, Len Tofft '37, has turned to "Presby" to do his two-timing. Something had better be done about this before he breaks the heart of this fair "Presby" maiden.

One senior metallurgical engineer, Chuck Squarey, had to make his holiday vacation complete, and so he dashed down to Delavan, Illinois, to see his little school teacher for a couple of days. He ought to drink more water to get rid of that very bad heart burn.

Then there's the heart rending story of Chuck Namensky who showed up at retreat last month with boots shining and brass gleaming only to discover after removing his overcoat, that he had left his Sam Brown at home.

Smoothy Bauerle turned up at the T. N. T. -Pi Tau Pi Sigma pledge dance in "tails" and top hat while the rest of us danced under the confining strain of full military uniform. However, we were feeling much better the next morning at military drill after having danced in boots than was Bauerle. Where did you go after the dance, smoothie?

Lieutenant McDonough explained the feasibility of the standard five-paragraph military "Estimate of the Situation" being applied to the student who has to get out of bed in a sub-zero dorm and get to his eight o'clock along these general lines:

Mission: To get to my eight o'clock.
Opposing Forces:
(a) Own: I've spent all night getting the bed good and warm.
(b) Enemy: The dorm is colder than the North Pole.
(c) Comparison: The bed is vastly superior.
Enemy Situation: The professor might spring a quiz. He might explain something that I can't afford to miss.
Own Situation: I'm rating a low "D." One more cut and I go and explain to the Dean.
Decision: Brrrr, it's cold.

Bill Janssen, railway engineer, has a hobby of riding interurban cars and collecting photographs of street cars, interurbans and railway coaches. Nothing like combining vocation with avocation.

Things certainly have come to a terrible state when Tony Kunzer insists upon remaining true to a certain young lady on the north side of Chicago. Come on Tony, it's against your nature. After all, Chicago is 130 miles from here and we won't tell on you.

Cliff Graham and Dave Harris, M. E. seniors are the envy of their hard-working brethern of the "engine school." Each landed a job with the Eastman Kodak Company of Rochester as the result of interviews with the Eastman Kodak representative who visited the campus recently. Dave is especially fortunate in that his home is in Rochester.

Al Reichmann apparently has all of the iron in his make-up concentrated in one spot. If there is a thumb tack in the room, Al never fails to draw it under him as he sits down upon a stool to design. We had planned to publish Al's favorite exclamation that never fails to come forth as he returns to a standing position with surprising agility, but the censor saw it first.

Not even the faculty is immune when it comes to pulling "boners." In a recent algebra exam, a problem was given of the simultaneous equation type in which it was required to find the ages of father and son. Imagine the dismay of the students and the embarrassment of the instructor when, upon solution of the problem, the child was found to be five and the father only three years of age.

Abe Charnes, a precocious chemist is leading a double life, judging from the number of times he fell asleep in Professor Paton's 8 o'clock class last semester. He is in favor of abolishing all 8, 9, 10 and 11 o'clock classes. It must be the heat that does it.

THE ENGINEER

Who is the man designs our pumps
with judgment, skill and care?
Who is the man that builds 'em and
who keeps them in repair?
Who has to shut them down because
the valve seats disappear?
The bearing-wearing, gearing-tearing
mechanical engineer!

Who buys his juice for half a cent and
wants to charge a dime?
Who when we've signed the contract,
can't deliver half the time?
Who thinks a loss of twenty-six per
cent is nothing queer?
The volt-inducing, load-reducing electrical engineer!

Who is it takes a transit out to find a
sewer to tap?
Who then with care extreme locates
the junction on the map?
Who is it goes to dig it up and finds
it nowhere near?
The mudbespattered, torn and tattered
civil engineer!

Who thinks without his product we
would be in the lurch?
Who has a heathen idol that he designates research?
Who tints the creeks, perfumes the
air, and makes the landscapes
drear?
The stink-evolving, grass-dissolving
chemical engineer!

Who builds a road for fifty years that
disappears in two?
Then changes his identity, so no one's
left to sue?
Who covers all the travelled roads
with filthy, oily smear?
The bump-providing, rough-on-riding
highway engineer!

Who is the man who'll draw a plan for
anything you desire?
From a transatlantic liner to a hairpin
made of wire?
With "ifs" and "ans," "however," and
"buts" does make his meaning
clear?
The work-disdaining, fee-retaining consulting engineer!

Who takes the pleasure out of life and
makes existence Hell?
Who'll fire the real good-looking one
because she cannot spell?
Who substitutes a dictaphone for a
coral-tinted ear?
The penny-chasing, dollar-wasting industrial engineer!

THE RIGHT ANGLE . . .

Let's Dance

Again this year the Engineering Council, guardian of the student engineer's extra-curricular activities and interests, is sponsoring the function which has become known as the best of the campus "clam-bakes," the St. Pat's Ball in commemoration of St. Patrick and all he stood for. In undertaking this dance, the council is flinging the collective engineer's gauntlet in the face of our esteemed neighbors of Lincoln Hall and its environs, who have gathered, not without some reason, we admit, the impression that the engineers have neither the ability nor inclination to do a bit of gambolling on the waxed surfaces, even when the opportunity is presented. Further, the conviction is rife among our South Campus friends that, merely because we do not look like a group of Morgan's star bond salesmen as we go to class, we are quite unable to turn out as well-dressed, good-looking assemblage of normal young men, without a slide rule peeping from a single pocket. That we are not of Jim Brady's habitat, where "them as has them, wears them," is no reflection on us; we are inclined to the other view.

Because of our innate modesty and good breeding, we of Engineering Hall and points north do not commonly pretend to the distinction of being heralded as campus smoothies; we leave that undoubted honor to those who, in contrast to us, get nothing from four years in the university but that honor. Hence, we don't make any rash statements about our superior abilities as trippers of the light fantastic; but we do claim, and justifiably, that our dance will display at least as good tripping of said fantastic as is found at many other important gatherings, even though our committee may not look like a group of Russian ambassadors in court. Whether our steps discribe an Archemides spiral or a Bernoulli Lemniscate is immaterial, so long as we realize the performance is creditable to our manner.

In order to sustain our challenge to society row, the council must request that the students come through with that which they alone can give—support. There have been written many words about the engineer's dance and reasons for attending it, and the quintessence of all these statements has always been that this dance alone, given by and participated in only by engineers, is the sole occasion at which the convivial spirits normally hidden behind leather jackets, can mingle with each other in a truly exclusive gathering. —A. E. S.

Policy

With this issue of the Technograph in your hands, you have received the third put out by the present Technograph Staff. There is one remaining issue, to appear in April. We have endeavored to give our readers what we think that they want; a typical college magazine rather than a technical publication. It would be folly for us who know so very little about engineering, to attempt to present lengthy and learned dissertations on scientific subjects. Instead we try to present material of a lighter vein, interesting material on engineering in general, news of general interest to the student, and, what we consider a very important part of the magazine, bits about the students themselves.

Perhaps we are wrong in assuming that the student would not like to see heavy technical material in the Technograph. If we are, but we believe we are not, we should most certainly be corrected. What would you like to see in the Technograph? Write to us at 213 Engineering Hall and give us the benefit of a subscribers viewpoint. We will be glad to try to remedy any objectionable condition and to give you what you want.

Final Examinations

Now that we are through cramming for the finals, let's look back back and see what benefits we derived from our last minute studying. Certainly our knowledge of the course was not increased to any great extent. We were, however, enabled to obtain a better grade on our examination which was, of course, the object of our cramming.

The present system of giving final examinations works injustice on those students who have consistantly done good work throughout the semester and places a premium on one's physical ability to stay awake the night before the final examination in order to learn the subject for a day—only to be forgotten in the cramming for the next examination. While the student who has been unable to obtain a satisfactory grade during the semester should be given a chance to show what he knows in a final examination, it is not justifiable to insist that those students who have shown their ability during the semester should undergo the rigors of the final examination. A misinterpretation of a question or a poor examination schedule may nullify one's consistant effort throughout the entire semester.

The existing theory is that the finals are just a breeze for the superior students. Actually, the superior student is under the greatest strain since he has everything to lose and nothing to gain from the final examination. He needs an exceptional grade on the examination or else his work during the semester is discounted. It is he who must search the book from cover to cover the night before the examination to prepare himself for every question that the professor can possibly ask on the morrow. However, the C or D student, who could use the review of the course much better than the superior student, has everything to gain and nothing to lose. Anything that he does on the final examination can only make the instructor's opinion of him go up while the exact reverse is true of the superior student.

Why then, should not the taking of the nerve racking, fatiguing final examinations be made optional to those superior students who have shown their ability by their conscientious effort throughout the semester? Such a system would:

1. Encourage studying day by day, which would necessarily mean that the students would get more out of their courses.

2. Allow students more time to review those subjects that need it most during the final examination period, instead of cramming. —G. L. J.

News of Scientific Achievements

New Products and Methods Developed

E-Electricity

The New York Aquarium is just completing some interesting studies upon an un-natural source of electricity, better known as "eelectricity." Actual experiments made upon a six-foot eel show that it supplies enough electricity to light a couple of neon glow lamps. The two two-watt neon lamps are attached in parallel to antenna loops atop two aluminum wires submerged at the ends of the eel's 10 ft. tank. Only one side of the neon bulb is illuminated, showing the discharge to be D. C. The potential varies between 125 and 200 volts.

Another Diesel Triumph

The railroad has again made a dramatic step towards keeping, or perhaps regaining, its supremacy as the principal means of conveyance for the traveling public. This new Diesel locomotive will haul the Sante Fe's crack flier, The Chief, between Chicago and California. It has the surprisingly light weight of 240 tons, or less than 20 pounds per H. P. The locomotive can be operated from either end, and can be used singly or as a multiple unit. It is conservatively rated at 3600 H. P., and has a fuel capacity of 1600 gallons. A steam generating unit is used for heating and air conditioning the cars of the train. The fuel oil is comparatively inexpensive.

New Type of Rectifier on Exhibit

C. T. Knipp, professor of experimental electricity, has had set up in his laboratory since early in January a cold-cathode type of rectifier, which he constructed.

The remarkable feature about this apparatus is that the negative element is operated at moderate temperatures rather than being heated to incandescence, such as is necessary in practically all kinds of electronic rectifiers which have been used up to the present time.

Operation of Professor Knipp's rectifier depends upon the limitation of the Crooke's dark space in a gaseous discharge tube. The principle has been known for about fifty years, but has never been applied in just this manner before. Successful operation of the rectifier depends upon obtaining the proper degree of vacuum in the tube; Professor Knipp accomplishes this by cooling a vessel of charcoal in liquid air. At a lower temperature the charcoal absorbs more gas and reduces the pressure in the tube.

Visual evidence of rectification taking place is provided for by both a gaseous discharge tube and a cathode ray oscillograph. Full-wave rectification is obtained. A high voltage and low current is used.

The identical apparatus was shown by Professor Knipp at the Science Exhibit sponsored by the American Association for the Advancement of Science at its St. Louis meeting during the holidays.

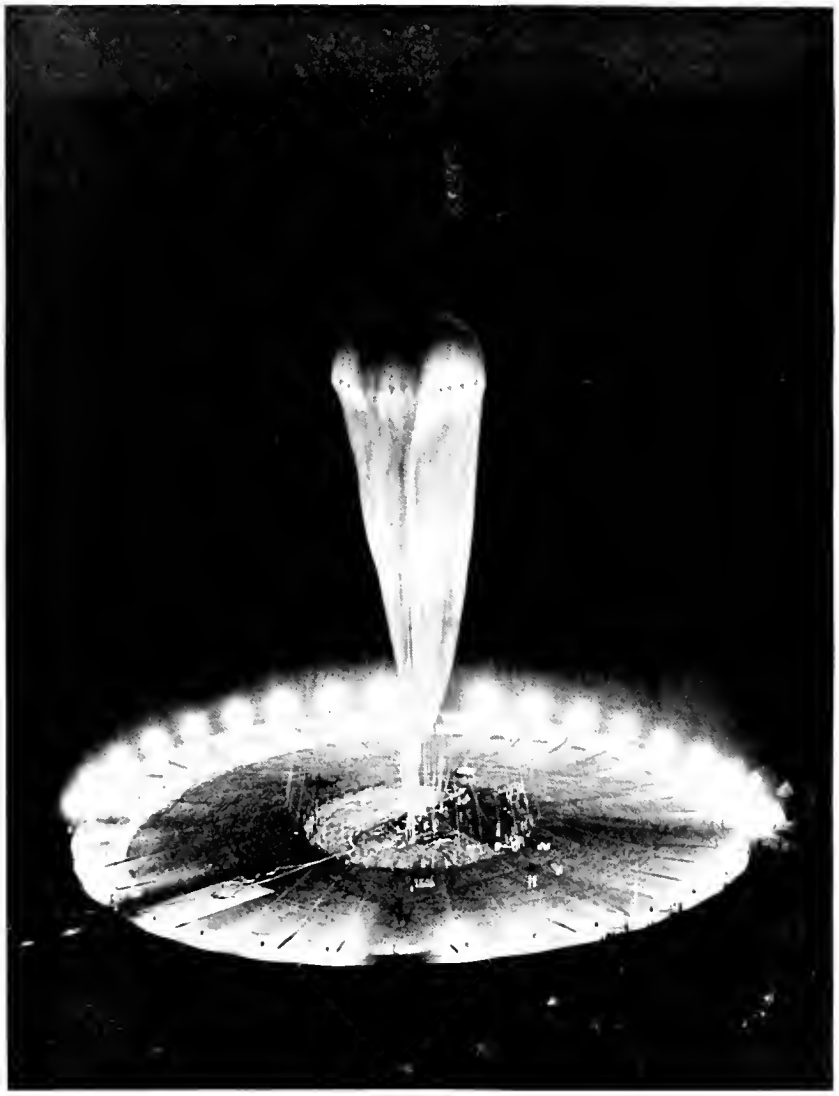
Vacuum Concrete

The vacuum process of removing excess water from freshly placed concrete has resulted in many satisfactory results. Finishing operations are eliminated, and at the same time, any type of non-skid surface can be developed. Cores and specimen cylinders of "vacuum compression" concrete have shown 7 and 28 day testing strengths to be from 53 to 81 per cent greater than for similar concrete not treated. The inventor also claims the elimination of shrinkage difficulties.

The equipment of a tight outside form, either steel plate or a rubber mat, and an inside layer of wire mesh or porous canvas which will permit the water to be drawn out by the vacuum cups attached over the holes on the outside form. Subjecting slabs of wet concrete (7 gallons of water per sack) to a 20 in. vacuum for 20 minutes removes about one-third of the water leaving the concrete stiff enough to walk upon.

A New Record

The stratosphere balloon, Explorer II, was prepared for departure on November 10 after a delay of two months due to unfavorable weather conditions. The objective height of 73,000 ft. was reached four hours after the balloon had been cut loose from its moorings. Remaining at this record height for approximately an hour, studies were made of the effects that great altitudes have upon photography, radio, cosmic rays, spore distribution and the spectral distribution of sunlight. Although only one-quarter million cu. ft. of helium was used for inflation, the balloon, at its record height, expanded to a volume of 3,700,000 cu. ft. Capts. A. W. Stevens and Orval A. Anderson brought the balloon down safely after making an official record of 72,395 ft., beating the un-official Soviet mark of 72,176 ft., and surpassing the F. A. I. record held by Settle and Fordney by over 12,000 ft.



Courtesy Aviation.

Explorer II being prepared for take-off from the Stratobowl, near Rapid City

200-Inch Glass Disk for Telescope Mirror

The contract for the construction of a 200 in. glass disk to be used for a telescope mirror was awarded to the Corning Glass Works late in 1931, and it was only after two years of painstaking preparatory work that the actual construction started.

The usual design for such a disk requires that the thickness be about one-sixth the diameter. A weight of about 40 tons would have resulted according to the old design. By coring the back with straight and circular ribs of sufficient rigidity, and by reducing the thickness from 33 in. to 25 in., the weight was reduced to 20 tons.

A Boro-silicate glass with a coefficient of expansion approximately one-fourth that of ordinary window glass was decided upon. The furnace, a rectangular pool covered by an arched roof of refractory brick, was heated with gas for ten days before any raw materials were induced into it. The charging operation required fifteen days and the constituents were fed at the rate of 200 lb. every half-hour using a total of 40 tons of raw materials. Six days were used for "firing," i. e., freeing the glass from gas bubbles. The molten glass was at a temperature of 1,580 degrees C. at the time of pouring.

Ingeniously Designed Mould

The mould was very carefully designed and every possible influencing factor was given consideration. The mould had to have sufficient strength to sustain the pressure of the glass, be sufficiently refractory to withstand the temperature without fluxing, and have excellent heat-insulating properties in order to prevent rapid cooling which would result in excessively straining the parts of the glass that were in contact with the mould. The mould had to be sufficiently porous to allow entrapped air to escape without forming bubbles in the glass. A commercial, high-temperature heat insulating brick, met the demands and was also readily cut to any desired shape. The mould was built upon a circular base plate supported by four screws, each four feet long and four inches in diameter and fixed onto a carriage, so that by turning the four screws in unison the mould could be raised and lowered and also moved, by the carriage, from the casting position to the annealing oven. Beneath the bed of the mould a number of electric heating elements were installed for use in annealing.

The completed mould had a center core of 40 in. diameter. This central hole is necessary as the Cassegrainian optical system will be used for the telescope. The cores, 114 in all, and the entire inner surface of the mould, were, finally, given a thin coat of silicate flour to produce a smooth finish and to prevent sticking. The cores were anchored by rods to the base plate. The lower ends of the rods were fitted with springs and nuts, so that a uniform tension would be maintained irrespective of the effects of expansion and contraction. They were kept cool by a stream of air drawn around them by an exhaust fan which also served to maintain a slight vacuum in the interior of the cores and thus to prevent the formation of blow holes.

The glass was kept in a molten state by building a dome of refractory brick over the mould and providing it with three pouring doors 120 in. apart. The cover was gas heated.

Pouring and Cooling

The mould and cover were thoroughly heated before the pouring began. Three ladles of 750 lb. capacity were used for the pouring. Only a part of the glass could be poured since a certain amount adhered to the rim as "ladle skin." This was collected and remelted when needed. After the pouring, a high temperature was maintained for several hours, to allow large gas bubbles to escape. The burners were then shut off, and the contents allowed to cool to a dull red heat.

The mould was lowered and then moved to the annealing oven, the operation requiring an hour. 304 heating elements, using a total length of 1,804 ft. of Nichrome ribbon, three-fourths in. width and 0.052 in. in thickness, were used for the annealing operation. The temperature was kept constant for 10 weeks and then lowered steadily 1 degree C. per day until room temperature was reached.

After annealing, it was examined with polarized light for internal stresses and then shipped to California where it is now being polished and ground. It is expected that it will take at least three years to complete this operation.

Dr. J. C. Hostetter is director of development and research at Corning Glass Works and Dr. A. U. McCauley is the physicist in charge of disk making.

World's Largest Power Shovel Dipper

32 cubic yards (level full) at one bite is the record of the world's largest power shovel dipper, recently placed in coal stripping service by the Northern Illinois Coal Corporation, near Wilmington.

Further comparative statistics reveal one dipper load would fill the average kitchen measuring 9x12x9 ft. high. It would take 32 wagon loads of dirt to fill this dipper. It would accommodate 32 men standing up comfortably. One complete dipperful from this monster would fill the average railroad coal car.

Demand for greater capacity in the coal stripping industry during the past few years, augmented by a substantially increased demand for coal from this property, resulted in the Marion Steam Shovel company devoting considerable of its engineering facilities to the cause. It was felt the climax had been reached two years ago when the then largest dipper was developed by the company and placed in service in the Illinois coal fields, at Farmington, Illinois, a dipper with 20 cubic yard capacity. This, however, merely proved to be the forerunner of the present masterpiece of construction—the 32 cubic yard dipper.

This shovel was viewed as part of the senior inspection trip of the Mining and Metallurgical engineers.

However, the major problem in developing this larger dipper was to increase its capacity without making it necessary to resort to a larger shovel. This was accomplished by building the dipper of a light weight metal alloy, which gave the required additional capacity without affecting the wearing qualities.

Phi Kappa Phi Initiates Seven Engineers

Seven senior engineers were among the forty undergraduates recently initiated into Phi Kappa Phi, national all-university honor society. Pres. A. C. Willard was initiated as an honorary member at the same time. Membership in this organization is the highest scholastic recognition that the University can give.

The engineers honored are, A. E. Bitter, C.E., E. P. Carter, Eng.Phy., W. A. Depp, E.E., G. L. Jeppesen, C.E., J. W. Luce, M.E., B. T. Sear, C.E., and C. G. Talbot, E.E.

Prof. H. F. Moore to Give Howe Lecture

Prof. H. F. Moore will deliver the Howe Memorial Lecture to the meeting of the American Institute of Mining and and Metallurgical Engineers in New York City on February 20. Professor Moore's topic will be, "The Correlation of Metallography with Mechanical Testing."

The Howe Memorial Lecture is an annual address delivered on invitation by an individual of recognized and outstanding attainment in the science and practice of Iron and Steel Metallography or Metallurgy. Professor Moore has gained world renown for his research in metals.

—Courtesy Scientific American.

One of the latest in diesels is the new diesel locomotive for the Santa Fe Railway.

Examination Boners

With the more or less successful completion of final examinations, there is nothing much to worry about during the next four months. However, lest one become too elated at having passed that C. E. 61 or M. E. 13, etc. course, the following material has been compiled from some T and A. M. exams, some of which is decidedly enlightening.

We realize the tremendous increase in braking power which is required by the modern high speed motor cars but really had no idea that at a speed of 300 miles per hour it required 3,168,000 ft. to stop Sir Malcolm Campbell's "Bluebird." According to that, the jolly old chap could cut his motor at the end of the speedway on the Utah salt beds, and with brakes applied, come to a halt six hundred miles away. That is equivalent to enough energy to carry him over the Rockies and into the Pacific ocean.

Definitions offer marvelous opportunity to encompass a large number of ideas within the bounds of a few words. Generally a good definition does not contain contradictions, but on examinations some definitions such as the following are certain to be encountered:

"The stress concentration factor is a factor taking care of the bending action of a load which is thought to be axially applied but which due to the conditions is not."

"The endurance limit is the maximum time a material can be bent or reversed before failure."

Another engineer reveals socialistic tendencies in the following description: "The S-N diagram is a **graft**" (Professor Moore, please copy) "with the unit strain plotted against the load.

Good 6 inch Column

The complaint raised last year that Uni Hall was structurally unsound could have been refuted on the calculation of safe loads of columns of one student. Given the problem of computing the safe load on a 12-foot column of 6-inch diameter, he obtained an answer of 1,160,000 pounds. Since the safe load is about 20 per cent of the maximum load, such a pillar could not be made to fail in the large 3,000,000 pound testing machine in the MTL.

Gene Schubert might get some valuable tips on the use and accuracy of the slide rule to use in future editorials from a computation submitted by H. K. Huntoon (M. E.) who found with the aid of the omnipresent and omnipotent "slip-stick" that a certain area was being subjected to a pressure of 12,000,0057 pounds per square inch. Right smack on the head, eh what, Gene?

Girls Take Prize

The feminine sex believes in applying knowledge gleaned from other fields of learning. One sweet little co-ed insisted on spelling **shear** with a double "e" during the entire semester. (Just another illustration of the deleterious effect of silk stockings.)

The following is an exerpt from "Caulking Yarns," the veracity of which cannot be authenticated. Here's what one co-ed wrote: "A bolt is a thing like a stick of hard metal, such as iron, with a square bunch at one end and a lot of scratching wound around the other end. A nut is similar to the bolt only just the opposite, being a hole in a chunk of iron sawed off short with wrinkles around the inside of the hole."

Work Begun on 1936 E. E. Show

Committee Members Named

Preparations are in full swing for the biennial electrical show. At a recent meeting of all the electrical engineering students C. G. Talbot '36 was elected general manager of the show. Other officers elected were E. C. Chamberlin, business manager; E. A. Post, treasurer; W. A. Depp, chief engineer; J. H. Stein, stunts; W. D. Orr, personnel; J. C. Skorcz, publicity; W. E. Miller, programs; N. H. Koertge, electrician; T. W. Johnson, construction.

The date of the show is set for April 16, 17, and 18. The exhibits of the show will be in the electrical engineering laboratory, the electrical engineering annex, and the physics building. The engineering physicists and the railway electrical engineers will also help sponsor the show.

The electrical show has been a biennial event for the last twenty-nine years. This show was originated by the students and is entirely managed by them. However, its success is only made possible by the hearty cooperation they receive from the faculty, the local business men, and the manufacturing concerns.

The purpose of the show is threefold. First it is educational. Many of the exhibits will acquaint the visitors with the newer developments in the electrical field. A few of the exhibits will explain in a simple and extremely interesting manner some of the older fundamentals of the science. Other exhibits will give the public an idea of what to expect in the near future.

The second purpose of the show is to entertain and to amuse. Many trick stunts are being planned to give everybody a hearty laugh. A few are designed to interest the visitors by puzzling and mystifying. This type of stunt gives the students a chance to display their ingenuity.

A third purpose of the show is financial aid to deserving electrical engineering students. The profits of these shows have been used to build up an electrical Engineering Student Loan Fund. Many students whose financial resources are not sufficient to put them through school will be aided by this fund.

At the last show, two years ago, the attendance was over four thousand. Over a thousand high school students from all parts of the state attended. Two special trains brought four hundred students from sixteen Chicago high schools. This year a larger attendance is expected than ever before. Special effort is being made to contact all of the high schools. All-expense tours and special bus and rail fares are being organized. All indications point to the most successful show of all.

And engineers—every engineering student on this campus should see this show. And furthermore—any engineering student who desires may take an active part in the show by merely arranging with Jimmy Stein, chairman of the stunt committee.

H. L. Grene, John Deere, Waterloo, Iowa.

S. E. Grimm, John Deere, Waterloo, Iowa.

J. A. McDorman, Granite City Steel Co., Granite City, Ill.

H. H. Krefft, Standard Transformer Corporation, Chicago.

ALUMNI NOTES

More Jobs Reported by Class of '35

Mechanical Engineers

Lowell B. Anderson, Illinois Steel Co., Chicago.

John W. Baur, Johnson Fare Box Co., Chicago.

Melville W. Beardsley, Caterpillar Trac- Co., Peoria, Ill.

Wilbur W. Betts, John Barnes Drill Co., Rockford, Ill.

Andrew P. Boehmer, F. B. Redington Co., Chicago.

Frank K. Dalrymple, Tide Water Oil Co., Tulsa, Okla.

Leroy A. Dixon, Special apprentice course, Pennsylvania R. R., Columbus, Ohio.

Julian L. Dodge, John Deere Tractor Co., Waterloo, Iowa.

Robert W. Eichenberger, Robins Conveying Belt Co., Passaic, N. J.

Harry P. Fienerski, Heat Reduction Corporation, Chicago.

Walter W. Grear, Museum of Science and Industry, Chicago.

Edward J. Piwinski, Crane Co., Chicago.

Lloyd R. Samuelson, Caterpillar Tractor Co., Peoria, Ill.

Fred A. Schick, Allis-Chalmers, Tractor Division, Springfield, Ill.

Norman A. Scranton, Williams Oil-o-matic, Bloomington, Ill.

Everett T. Simonson, I. C. R. R., Padukah, Ky.

Fred L. Spaulding, John Deere Tractor Co., Waterloo, Iowa.

Ralph F. Stanford, Herman Nelson Corporation, Moline, Ill.

Clarence H. Stein, Caterpillar Tractor Co., Peoria, Ill.

Howard W. Stellner, Fairbanks-Morse Co., Beloit, Wis.

Lewis M. Thomas, Youngstown Sheet and Tube Co., Conway Bldg., Chicago.

James A. Vitzthum, American Creosoting Co., Toledo, Ohio.

William P. Vlach, Illinois Steel Co., South Chicago.

Everett F. Wagner, with his father in Kewanee, Ill.

Wallace J. Weirich, A. C. Spark Plug, Chicago.

George W. Miles, F. I. Raymond Co., Chicago.

W. K. Mayfield, Rex Coal Co., Eldorado, Ill.

Lewis S. McClure, on Bay Bridge, San Francisco, Cal.

Ralph W. Lazear, American Blower Co., Detroit, Mich.

Electrical Engineers

C. R. Barrick, International Harvester, Chicago.

R. D. Besse, International Harvester, Chicago.

I. R. Carter, Parkersburg Rig and Reel Co., Pampas, Texas.

H. D. Cooper, Clough-Brengle Co., Chicago.

F. P. Preve, grad work, U. of I.

E. A. Rehwald, John Deere, Waterloo, Ioka.

J. H. Riggs, Wurlitzer Co., Chicago.

S. F. Smith, International Harvester, Chicago.

A. R. Stover, Refrigeration work, Oak Park, Ill.

A. W. Surie, Clough-Brengle Co., Chicago.

W. D. Weisberg, Clough-Brengle Co., Chicago.

Civil Engineers

William F. Barnes, Jr., Austin Co., Chicago.

Max Schlesinger, Illinois Highway Department, Carbondale, Ill.

Charles J. Harrington, Chicago, Milwaukee, St. Paul & Pacific R. R., Chicago.

Roscoe T. Cook, Scott Flying Field, Belleville, Ill.

Sam C. Roberts, Chicago, Milwaukee, St. Paul & Pacific R. R.

J. O. Pokorny, Illinois State Highway Department.

Wallace S. Johnson, Illinois Division of Highways, Springfield, Ill.

R. O. Luetzelschwab, Illinois State Highway Department, Millstadt, Ill.

Fred T. Bailey, Truax-Traer Coal Co., Canton, Ill.

Gaylord D. Weeks, City Engineering Department, Springfield, Mo.

A. P. Troemper, Illinois Department of Public Health, Division of Sanitary Engineering.

Charles E. Hughes, Jr., Ash Howard-Needles & Tammen, Kansas City, Mo.

John E. Burke, State Highway Department, Freeport, Ill.

A. I. E. E. Looks Ahead

The members of the student branch of A. I. E. E. are looking ahead to a season of added prestige and tremendous activity, for they are already making plans for the coming spectacular E. E. Show, for many years a biennial highlight in University activities.

In looking ahead, those who are curious might be tempted to look back over happenings of the semester to find wherein doth lie this strange power which binds those E. E. boys together. The high quality of the past E. E. shows bears mute witness to the highly spirited cooperation which the branch has instilled into its members.

The first meeting of the year was a membership drive. Curt Talbot, executive head of the branch, caused refreshments to be served, and by this and other means raised the branch membership over one-hundred per cent to a new figure of 120.

The subsequent meetings fairly bristled with activity. The business meetings were carried out with great precision and dispatch, as was the December 10 election of officers for the coming E. E. Show. At almost all of the meetings a talk on some interesting phase of electrical engineering has been presented. In two cases, these lectures were given by members of the branch: a talk by Ed Chamberlin '36 on the "Electrification of the Illinois Central Railroad" and another lecture by Wes Eddy '36 on "The Construction of Norris Dam," illustrated with slides and movies.

Many lectures are sponsored by the branch were definitely entertaining as well as illuminating; for example, colored movies of Waukegan Power Plant and San Diego Exposition explained by Mr. Herz, and another lecture on Lightning by Mr. K. B. McEachron of the General Electric high voltage laboratory.

Another type of lecture sponsored by the branch was the one given by E. C. Molina, the Switching Theory Engineer of the Bell Telephone Laboratories, in which Mr. Molina explained how the mathematical theory of probability could be applied to practical problems.

It is through these carefully planned meetings that the members of the branch learn to enjoy the value of cooperation which has made A. I. E. E. such a success on the University campus.

Technograph Staff

If you were bothered half to death during the past month by someone who asked you embarassing questions or wanted to know your life history or got in your hair in a general way, it was probably by one of the following hard working and little praised members of the Technograph editorial staff: John Sherman, Ed Hong, Gordy Jeppesen, Bob Cline, Rex Newcomb, Jr., Bob Zaborowski, Hal Gocke, Jim Stein, Ray Purl, Harry Nagel, Jim Skorcz, Chuck Squarcy, Gene Schubert, Herb Goltz, Dick Gade, Harry Skinner, Wally Depp or Jim Robertson.

If he succeeded in collecting some money from you or selling you a subscription it was probably Walt Renner, Dean Kingman or Irv Lewis of the business staff.

We thank the many contributors who co-operated so well with us in our quest for interesting material.

Reconditioning of Defective Metal Parts

The Gussolit welding and the Schliha metal-spraying processes, while only comparatively new, are rapidly growing in importance and, therefore warrant description.

Dr. Klapstock has developed a material described as a high-grade cast-iron alloy, which has an extremely fine structure and possesses a Brinell hardness of 230. The process itself consists of first heating the defective pieces to 850 C., coating with a special flux, and then applying the Gussolit welding bar which is melted into the cracks or defect. The flame is directed in a direction parallel to the working surface in order to prevent excessive heating. The piece, as a whole, is not distorted. Cracked motor-car cylinder castings, turbine castings, and other engine parts have been successfully repaired. Coating porous high-pressure steam and hydraulic press cylinders has enabled them to withstand pressures of 130 atmospheres, whereas leakages were encountered at 25 atmospheres. Holes drilled too large have been successfully reclaimed by applying a thin layer of Gussolit.

The Schliha metal-spraying process is used for building up and re-conditioning internal combustion engine cylinders, shafts, and bearings. A specially designed spray pistol is used, and the metal to be sprayed is fed, automatically by air pressure, to the nozzle where it is melted by an oxy-acetylene or an oxy-hydrogen flame and then projected as a fine spray by means of compressed air under a pressure of 2.5 atmospheres. The wire used may be steel, bronze, copper, aluminum, and, in fact, just about anything the workman may desire. Steel sprayed on cylinders has a Brinell hardness of 300. An engine having 12 cylinders (2.95 in. diam. and 5.79 in. long) can be sprayed to a depth of 1 mm. in 25 minutes. Spraying of piston ring slots with steel as a precaution against premature wear is now being developed by an aero-engine manufacturer.

The Value of the Scientific Attitude

Prize Tau Beta Pi Essay by W. A. Depp

It has been said, perhaps in satire, that some of the Greeks were so blasphemous, rebellious, and so depraved that they would not accept any statement of the priests, kings, or elders, regardless of how effectively it might have been expressed, without proof. However true this may be, we owe to the Greeks the credit for the invention of intellectual desire. Because of this desire they developed mathematics, physical science, and philosophy,, and in so doing, established the rudiments of the scientific method. The Greeks, however, lacked mechanical ability and did not care for actual experimental work. It remained for men like Leonardo da Vinci to combine mechanical aptitude and experiment with mathematical ability. The success of the experiments of da Vinci and others was due largely to the use of the methodical approach, to the making certain basic assumptions, and to the judicious selection of facts with which to work. This determination and ability to get at the truth without being influenced by outward appearances, by one's own notions or prejudices, or by one's own wishes and desires is now termed the scientific attitude or scientific frame of mind.

The value of the scientific attitude to the scientist is unquestionable. In fact it is a sine qua non of his existance. However, it is not often realized that the scientific attitude can be useful to a man not engaged in science. Part of its value lies in the demands it makes upon the individual. It requires him to display independence and self-initiative in breaking away from custom. It requires him to be unselfish and impartial in order that his judgments will not be guided by his own wishes and desires. In other words, he must be able to treat a problem objectively. The scientific attitude also teaches him not to place too great an emphasis upon individual events or single observations, but to look for common characteristics and general laws and conditions. In this way he may be able to partially explain present events with reference to past events. That is, they may be governed by some common law. Perhaps also he may be able to formulate some small idea of the future.

Society as a whole would benefit by accepting a more scientific attitude toward social problems. Huxley once said that our civilization is very scientific in its attitude towards engineering and aeronautics, but highly unscientific in its attitude toward education and politics. If people had more faith in science and its methods, perhaps the scientist himself would have a better chance of improving our world. But more important than that, it would encourage a sensible attitude towards life instead of one based on tradition and prejudice.

"Erin, Go Bragh!"

'Twas in Missouri in nineteen three
On St. Patrick's anniversary
That the Engineers miraculously found
A mystic stone beneath the ground
A legend on its face it bore
That puzzled scholars by the score.
No punlit from L. A & S.
Could make it out, or even guess
The meaning hidden in those words,
Irrational as logs and surds.
They made a dozen grave faux pas
Trying to translate "Erin, go Bragh!"
A scientific volunteer
Deciphered "Pat was an Engineer."
And thus the words that seemed so wild
Were plain to even a P. E. child.

And yet no one there who knew
Just what that stone was—how it grew
In old Missouri's stoneless dirt,
Undeciphered and quite inert
Until that Engineer found out
That Pat had been a darned good scout.

And now there's never a building boom
Without St. Pat dispelling the gloom
That ordinarily falls to the lot
Of the Engineer who serveyed the plot,
Or drained the meadow, or built the bridge,
Or ran the highway along the ridge.
Or played the amperes, ohms, or volts,
Or figured pitches of threads on bolts,
Or messed around in colloidal clay,
Or worked out problems for pitiful pay,
Or married a wife he couldn't please
With mathematics or calories.

And now, St. Pat, so well you've done
That a niche in Heaven you have won.
The pathway of the student throng
Is rough and thorny all along;
'Tis oft beset with kinks and quirks
In spite of all your noble works.
The students would be better off
If Life's dark blinders they could doff.
And so, St. Pat, I give you now
This radiant halo for your brow,
'Twill light the pathway of our School,
That Engineers may brightly rule.

Mineral Industries Society

At a meeting held on December 11, 1935, H. B. Corley, an Illinois gradnate, and designing engineer for Allan-Garcia Company of Chicago, spoke on his experiences in Russia. His very interesting and entertaining speech was illustrated by movies.

The next meeting of the society will be held February 13 when Mr. F. J. Meek and W. B. Good of the Eagle-Picher Lead Company of Hillsboro will talk on the metallurgy of lead and zinc. Other meetings of the next semester include talks by students who worked in mines last summer, and by members of the State Geological Survey.

Mr. F. J. Pettyjohn of the geology department at the University of Chicago may journey to Urbana to address the society at a later date.

Concrete Pumping System Simplified

At the construction of Boulder dam, Madden dam, and the Golden Gate bridge at San Francisco a new labor saving device made its appearance which greatly simplified handling of concrete. Instead of using elevator buckets as was formerly done on large construction jobs, the new device forces concrete through pipe lines by means of a special type of pump developed by the Chain-Belt Co. of Milwaukee, and known as the "Rex Pumperete."

By this method large volumes of concrete can be speedily and economically transported to distant points and raised as high as twenty stories above ground. The Pumperete consists of a more or less conventional single acting reciprocating pump. However, owing to the nature of the material handled it has been necessary to depart from conventional pump design in several respects. The diameter of the plug valves has been made almost as large as the cylinder bores to avoid packing and to assure an even flow of concrete. Sharp corners and sudden changes of direction have been avoided in all parts of the pump and pipe line for the same reason.

Concrete has a peculiarity of "stowing" where there is a sudden reduction in the size of the passage through which it is forced. This characteristic is turned to advantage in the design of the valves. Instead of closing fully, these valves normally close only partially, as the concrete itself will block the remaining small opening. This eliminates any danger of breaking valves which might occur if they closed on the hard gravel constituent of the mixture.

The development of this pumping apparatus involved a rather thorough investigation of construction materials, owing to the highly abrasive action of concrete. Moreover, its weight alone is sufficient to set up severe stresses in equipment handling it.
Hence the Chain-Belt Company specified a wide use of alloy steels and cast irons. For the liners, which demanded high-wear resistance, many materials were tried out, including heat-treated steels, and the result of these comparative tests was the adoption of centrifugally cast liners of a heat-treated nickel-chromium-molybdenum cast iron. These liners, furnish to a minimum Brinell hardness of 500, have given excellent service.

The piston on the Pumperete pump is cylindrical, 8 in. in diameter, and 3 ft. long with a wall thickness of $\frac{1}{2}$ in. The head at one end is 2 in. thick, and about two feet from the head there are heavy wrist pin bosses with a metal section of 3 in. Because of the large amount of machining necessary on this part, as well as the necessity of having the metal close-grained, dense and wear resistant, it was a difficult casting to produce. However, the company has now standardized on an iron of the following composition, containing 50 per cent steel in the mix: total carbon 3.20 per cent; Nickel 2.50 per cent; Silicon 1.75 per cent; Manganese .70 per cent.

These pistons, ground on the outside surface, take an exceptionally high finish and resemble highly polished forged steel. The average Brinell hardness is 350, and transverse tests show a breaking strength of over 5,000 lbs. on 12 in. centers. The bed or frame is made from a cast iron similar to that used for the piston, except that the nickel content is around 2.00 percent, and .75 per cent chromium is added.

Terzaghi May Speak Here

Professor Carl Terzaghi, widely known authority on soil mechanics, has accepted an invitation to give a series of three lectures on "Soil Mechanics" here during the week of March 29. Whether or not he will be able to come here depends on his work at Harvard University where he has accepted a visiting professor position for the second semester. Professor Terzaghi spoke on the same subject on our campus three years ago.

Goeke Receives Scholarship Award

H. E. Goeke, sophomore civil engineer, received the Frank Morrow Memorial Award, given each year to the sophomore C. E. having the highest scholastic average by Chi Epsilon, National Civil Engineering Honorary Fraternity. Mr. Loran D. Gayton, City Engineer of Chicago, was principal speaker at the annual Civil Engineering-Faculty dinner at which the presentation was made on January 16. J. D. Taylor, first semester president of Chi Epsilon, was toastmaster.

Goeke received an award from Chi Epsilon last year for attaining the highest freshman scholastic average at that time. His sophomore average is 1.86.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of The Illinois Technograph published four times a year (September, December, February, April) at Urbana, Illinois for February 1, 193b.

State of Illinois } ss.
County of Champaign }

Before me, a notary public in and for the State and County aforesaid, personally appeared R. H. Benedict, who, having been duly sworn according to law, deposes and says that he is the business manager of The Illinois Technograph and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management and the circulation, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations.

That the names and addresses of the publisher, editor, and business manager are: Publisher, Illini Publishing Company, University Station, Urbana, Illinois;

Editor, W. E. Hendricksen, Champaign, Illinois;

Business Manager, R. H. Benedict, Urbana, Illinois;

That the owner is The Illini Publishing Company, a non-commercial organization whose directors are W. E. Britton; O. A Leutwiler; F. H. Turner; Delores Nagoda; E. R. Hodges; H. W Clement; F. S. Siebert; N. D. Cline.

R. H. BENEDICT, Business Manager.

Sworn to and subscribed before me this 24th day of October.

(SEAL) O. K. BURTON,
Notary Public.

TECKNOKRAKS

T. N. Hackett: Life was a desert to me until I met you.
Lulu Belle: Is that why you dance like a camel?

War does not determine who is right—only who is left.

"What's the most popular saying among the midists?"
"You shed it."

Anne R.: Is it my head on your chest that thrills you so?
Rex Newcomb: No, I'm sitting on an ant hill.

Bonnie: Did I ever show you the place where I hurt my hip?
Cliff Graham: No! No.
Bonnie: All right, we'll drive over there.

"I pulled a good one that time," remarked the farmer as he finished milking the cow.

"Oh, gosh!" lovely Lucy exclaimed "It's started to rain. You'll have to take me home."
"Why, I'd love to," stammered Russ Smith, "but, you know, I live at Newman Hall."

The girdle manufacturer lives on the fat of the land.

Jack Abbott: I think I have a flat tire.
Marcella K.: Give me time, we just started.

Mother: Quiet, dear, the sandman is coming.
Modern Child: O. K. A collar and I won't tell Pop.

"Mine is no idle tale," said the freshman as he leaned over for another whack.

E. J. Jasinski: How about a kiss, honey?
Olive May: No, I have scruples.
E. J. J.: S'al right, I've been vaccinated.

A pedestrian is a man whose son is home from college.

R. H. Menefee: I was all set to propose to you last night, but I lost my courage.
Dorothy H.: How did that happen?
R. H. M.: I think it must have fallen out of my hip pocket on the way over to your apartment.

Any cat can be the cat's whiskers but it takes a Tom cat to be a cat's paw.

E. M. Volle: Let's do the elevator dance.
Isabelle T.: What's that?
E. M. V.: Over in the corner with no steps.

For years the sexes have raced for supremacy—now they have settled down to neck and neck.

Sign on theater: Mae West in "It Ain't No Sin."
Sign on tabernacle across the street: "'Tis too."

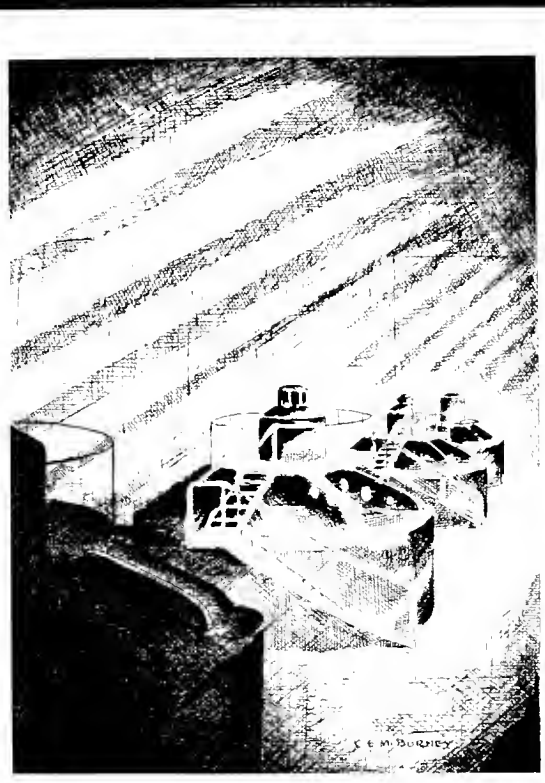
E. Brandel: Baby, I can read you like a book.
Eliza N. O.: O. K., but lay off the Braille method.

Some cause happiness wherever they go; others whenever they go.

First old maid: What were you screaming about last night?
Second old maid: I had an awful dream. A man was chasing me and couldn't catch me.

Heard at the Ohio State-Illinois Game.
Morrison: "Coach Ruby has bought some new, waterproof pants for our basketball men."
Mary: "Oh, the big babies."

THE ILLINOIS TECHNOGRAPH



MEMBER OF E. C. M. A.

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● The modern truck tank is *better because it's welded!* Welding—the jointless construction—gives greater strength with less weight and bulk . . . makes possible bigger pay-loads. The welded tank is seamless, smooth—inside and out—no rough spots for corrosion—no place for germs to lodge.

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LINDE OXYGEN UCC UNION CARBIDE
PREST-O-LITE DISSOLVED ACETYLENE
OXWELD WELDING AND CUTTING APPARATUS AND SUPPLIES

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

APRIL, 1936

Volume 50 Number 4

● The 1936 edition of the electrical Engineering Show is ready to throw open its doors. Each new exhibition never fails to amaze the eager throngs that file through its exciting aisles of exhibits. J. H. Stein, in charge of stunts for the Show, describes some of the things that you will see at the Show on April 16, 17, and 18.

● How to get a job is a question that is puzzling a great many seniors as the time for graduation approaches. Gene Schubert has made a study of the question and he presents his answer in the article, "So You Want A Job."

● Advice, facts and opinions are combined in a page of comments by faculty men on the class of '36, an interesting page garnered and presented by Bob Cline.

● The latest developments in commercial aviation are told by Gordan Jeppesen in his article on "Expanding Commercial Aviation." Bureau of Commerce figures show commercial air travel to be eight times safer than automobile travel.

● The last of a series of four articles on the history of The Technograph appears in this issue, the last of the Golden Anniversary Volume. The story describes the growth of The Technograph from 1918 to date. You will recognize many names in this month's review.

Contents

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This Picture of a Line of Beecheraft Aeroplanes is Being Exhibited at the Present Time in the Louvre in Paris

Presenting The 1936 E. E. Show

To Be Held April 16-17-18

APRIL 16, 17 and 18 are the dates for the biggest and best Electrical Show yet held on this Illini campus!

Over two hundred students and two dozen faculty members in the department of Electrical Engineering and Physics have worked morning, noon, and night these last few weeks to prepare this array of fascinating, mysterious, and instructive phenomena and apparatus.

It has been said that the University of Illinois Electrical Show is ten years ahead of the rest of the world. The latest ideas and inventions are displayed, along with enough fundamentals of electricity to give even the most distant layman full appreciation of electrical devices. (We said "appreciation," not "understanding.")

These energetic E. E. and Physics students, with the unstinted cooperation of the faculty, have set up a variety of exhibits which cover the field like a Mid-West snowfall. From Faraday to photo-cell, from Ben Franklin to burglar alarms, from telegraph to television, you will find many things to interest you, even though you be the most blase sort of a person.

Started in 1907

The Electrical Show has been a tradition on the University of Illinois campus for over twenty years. The first show was given in 1907 with the purpose of raising money for a contribution to the Robert Fulton Memorial in New York. This constituted one of the few large contributions and therefore it attracted considerable attention to the Engineering College, even from individuals and groups in the east. In short, the plan was such a success, and aroused so much enthusiasm among the students, that it was decided to stage a second show the next year. Since then it has been presented every two years. Although at first the show had occupied only a small portion of the E. E. laboratory, by 1915 it had grown to such proportions that it was necessary to extend it to other engineering buildings. The show that year broke all previous records. By 1921, the affair had gained such national recognition that the large electrical manufacturers and utility companies were eager to exhibit their products along with the educational demonstrations and trick displays erected by the engineering students. Finally, lack of space has made it necessary to eliminate most of the commercial exhibits, the students' stunts requiring all the room which is available.

Helps Deserving Students

A part of the proceeds from each show is set aside as a guarantee fund for the show two years later. The remainder is applied to a loan fund for deserving engineering students. Responsibility for the entire production of the show rests upon the students in the electrical department.

This year the management of the show has made a special effort to secure as many new exhibits as possible, and to present ample opportunities for the visitors to actually operate the apparatus or to take an active part in the stunt in some manner. For example, consider the electric chair. Did you ever see a person's hair stand on end? Well, come to the show and bribe your friend (?) to sit in this chair, and watch the fun. When the "juice" is turned on, his scalp will actually reach for the ceiling.

There is a device for measuring the resistance of the visitor to the passage of an electric current. Whether this

C. G. TALBOT
General Manager

has any relation to one's resistance to other things, such as disease or temptation, remains to be seen.

Many Instructive Exhibits

In an entirely different class of exhibits are those designed to instruct the spectator concerning some recent development in the electrical field. An example is the Directional Wireless, a means of communication similar to radio but possessing a very marked advantage over it, namely, that it may be sent as a beam directly to the receiving end, thus eliminating the possibility of anyone else "listening in." The usefulness of such an invention, especially during time of war, is obvious.

Another instructive piece of equipment is the facsimile telegraph. It shows how modern news photos are dispatched over wires, enabling one to see in the morning paper a photograph taken only the day before in Europe. This apparatus was built here on the campus and reproduces pictures, printing, even your own handwriting. The receiver may be seen in action.

A very fascinating exhibit is the model railway set up by the Railway Club. Automatic operation and control, and electric signaling are reproduced in detail.

Mystification for those who like to be fooled is provided by a number of illusions: lighted bulbs without any wires leading to them; objects floating in the air with no apparent support; heating rivets red hot by holding them in a bucket of water. In fact, there is a stunt for every taste.

A novel feature introduced in this show is an apparatus for making recordings. Here the would-be Bing Crosbys may croon and take home a phonograph record of the result. And those who are proficient in imitating the calls of farm animals will want in on this too.

Many humorous incidents have occurred in past shows, and if all were collected they should furnish no little amount of entertainment. The students running the show have to be continually on guard against some technically informed visitor coming up, asking a lot of questions, and finally making a fool of the poor student.

A Word of Advice

A word of advice might be well here: —Don't believe everything you see in this show, just make sure you see it.

After much digging around on the banks of the Boneyard, a number of prehistoric electrical machines have been unearthed. These may all be found in the Show Museum. This Museum, however, is not so dead as the ordinary type; the exhibits have been brought to life by means of an injection of electricity into their veins.

The person who likes to exchange wise cracks and personal insults, as a sort of a game, will find his equal in the show. What a picnic he should have in a verbal battle with the Talking Skull that sees all, knows all. He shall have to control his temper, though, for the Skull always gets the last word. A committee of Engineers have been investigating the rumor that this is the skull of Socra Taunt, brother of Socra Tease.

And so we could go on and on, describing every stunt in the show, but that has already been done in the program.

Commercial Exhibits

It will suffice to say here that in addition to the exhibits arranged by the students, a number of demonstrations have been contributed by well-known commercial organizations. General Electric, for instance, is sending several exhibits from its House of Magic that have never yet been shown to the public.

Movies showing late developments in the electrical field, and other special programs, will be presented at scheduled hours. Student guides will escort visitors on tours of inspection about the engineering buildings and other points of interest on the campus. Attendance is promised from all parts of the state.

It has been planned to run the show from 7:30 to 10:30 o'clock Thursday, Friday, and Saturday nights. The Saturday daytime schedule will be from 9:00 until 12:00 and from 1:30 to 5:30.

See you at the Show!

Survey Shows 179 Students in

N. Y. A. In College of Engineering

Many Interesting Projects Under Way

IT WAS very gratifying to the writer, after having heard the current charges of "Boondoggling" and "Leaf raking" hurled at the workers of the National Youth's Administration, to find that in regard to the Engineering Campus, at least, such accusations were entirely unfounded. All the N. Y. A. employees are engaged in useful, valuable work, and most of them are very enthusiastic about their assignments. Many students who would otherwise have to abandon their college work because of financial difficulties, are being enabled to continue their education by virtue of government paid earnings from N. Y. A. jobs.

The N. Y. A. force in the College of Engineering is divided into twelve groups, each of which is under the supervision of professors from the various departments, and Associate Daen H. H. Jordan is the college administrator for the whole force. There is a total of 179 workers employed, and in some instances the departmental groups are further sub-divided among several directors so as to facilitate the handling of different types of work within a department.

Civils Are Sub-divided

This is notably true in Civil Engineering, where Prof. Huntington has allotted the employees in his charge to nine other men. The workers on this project, which is one of the largest in the college, are engaged in various types of endeavor including experimental sanitary work under Prof. Babbitt on methods of disposal of waste, research on timber structures, soils, mechanics, calculations dealing with foundation settlements, structural design work, and general drafting.

In the Mining and Metallurgy Department some of the employees are engaged in preparing specimens for laboratory courses in metallography, some are constructing mine and geological models for class room instruction, while others are acting as laboratory assistants in a research project on the utilization of mine wastes. Some drafting is also being done on this project, as well as research in mine ventilation and preparation of mineral and rock specimens for class room use. Under the direction of Professor Mitchell a research investigation is being conducted on the sampling of coal. Prof. Mitchell said that this work was very useful and important, and that several industrial concerns, as well as the department itself, had considered providing the necessary funds, but that none would be available except for the N.Y.A.

G. E. D. Making Maps

The G. E. D. Department has the largest project in the College of Engineering and has undertaken quite a task, that of providing the State Water Survey with a tracing of every town in Illinois. An idea of the magnitude of the task may be derived from the fact that after more than three semesters' work only twenty five of the one hundred and two counties in the state have been completed.

The Physics Department has one of the smaller projects and its employees are engaged in setting up apparatus for light experiments, making equipment for physics lecture demonstrations, working in the student shop, and some are working as research assistants on various experiments.

Chemists Compile Patent Data

In Chemical Engineering a great deal of work has been done on the compilation of a bibliography of patents in the field of removal of sulfur dioxide from flue gases, and twelve patent applications have been made. Mr. Johnstone said that such a bibliography of a patent literature will be the only one of its kind in the country. Some work is also being done on preparation of various standard substances, on electrolysis, construction of apparatus, and on experiments of different kinds. For the experimental and research work, graduate students would be more desirable, but the undergraduates are quite satisfactory for the more routine work requiring less knowledge and training.

The Railway Engineering Department has the smallest group of N. Y. A. employees in the college but some interesting and important work is being accomplished. Clerical work on manuscripts and bulletins is being done, as well as drafting and even some translation of reports on Russian railway research. One man is helping Prof. Young on low speed train resistance tests, and others are making calculations from data obtained by Prof. Schrader on high speed and high pressure friction tests.

The Electrical Engineering Department has a fairly large N. Y. A. staff which has reached out to include a great variety of tasks. Some men are working in the shop, some in the electronics laboratory and radio laboratory, while others are constructing special equipment for research or doing drafting or wiring. A few are engaged in research on watt-hour-meters, some do repair work on the standard instruments and equipment, and a number were making a survey of campus study lighting conditions, the results of which are very edifying. Prof. Kraehenbuehl has compiled data representing quite extensive research and his conclusions are so striking and relevant that we think it worthwhile to mention some of them here. His staff found that of 2299 cases investigated, 95.5% of those students were studying under very inadequate illumination. According to Prof Kraehenbuehl, these results should prove very enlightening even to the engineers (no pun intended, he assured us), and he says it gives him a headache just to think of people studying under such lighting conditions as were found to exist.

In T. A. M. all the N. Y. A. men are engaged in setting up apparatus or otherwise assisting on various experiments. One interesting investigation is on the creep of lead at ordinary temperatures, which phenomenon causes much loss annually to some concerns. Under Prof. Richart's direction some work is being done on concrete columns and some on car wheels. According to Prof. Seely, these students develop many practical skills as well as learning about the properties of the various mtaerials, and if they are alert they get much more from their work than the actual pay. Prof. Seely expressed the attitude of most of the other project supervisors when he said that not nearly so much work could be accomplished without the help of the N. Y. A.

The men in the Mechanical Engineering Department are working on a number of different tasks such as construction of special equipment, computation of valuable tables, and drafting which includes preparation of instruction cards for M.E. 87 and also of material for use in class room instruction in heating and ventilating.

An interesting phase of this project is the experimental work, which includes readings and calculations, being done in regard to warm air furnace heating at the research residence at 1108 W. Stoughton.

Associate Dean Jordan's personal project in the college office is busy with clerical work and also with statistical research and drafting to interpret pictorially the results of the statistical work.

Ceramists Experiment

The Ceramics Department uses its N. Y. A. help in various types of work ranging from clerical work to plain manual labor. Some drafting is done, while some men set up apparatus for experiments, and the more experienced ones act as assistants in research, some even doing independent experimental work. At present independent work is being done on the wearing away of ceramic materials and on the thermal expansion of commercial glass. All the work being done in the department is necessary and useful, and gives the men valuable training. Last year some of the results of this N. Y. A. work were published and it is probable that some will be published this year as well.

In Prof. C. C. Wiley's traffic and highway project is one of the most currently interesting and pertinent in the college. It is in part a continuation of the belt-line traffic survey which was conducted to see if traffic conditions in the Twin Cities warranted the construction of a belt-line for through traffic, and has been extended to include a study of campus traffic conditions. Some of the workers have been compiling bibliographies of safety engineering, and others have been engaged in a study of automobile license visibilities and highway signs and markers. The traffic conditions on Green Street were studied and the results of this investigation led to the installation of the traffic signals on the campus and the later change in the signal cycle, the effects of which are now being studied.

Inventors Constantly Working

Expanding Commercial Aviation

New Developments Disclosed

THE Master Mind chuckled with satisfaction as he watched the movements of each plane of his mighty fleet, pictured before him on his super stratosphere screen. We've all read such seemingly impossible stories in our younger lives. They portrayed very vividly, the futuristic dreams of several modern authors, probably very few of whom believed that the inventions of their imaginations would ever materialize. However, the super stratosphere screen of a few years ago is, today, a reality.

This mirror of the sky, as it is called, is the invention of Dr. Spitz. The pilot's path is traced by lights which are actuated by short wave radio impulses. The sound of the ship's propellers are picked up by two microphones in the plane and are relayed to the central airport by radio transmitters in the ship. Here they are received by an automatic tuning device and are sent through two more newly invented instruments, one of which gives the direction and the other the distance of the plane from the airport. The Spitz flight recorder is another of a long series of advancements for the purpose of improving the safety of commercail aviation.

Safer Than Automobile

The safety of flying has increased to such an extent that Bureau of Commerce figures show that it is eighty times safer to ride in a commercial plane than it is to ride in an automobile. Aids to blind flying have done much to help this safety record. Where the pilot used to have to rely on his compass and experience to guide him to his destination, he now simply tunes his radio to the frequency of the transmitting beacon of the airport at his journey's end, and then flies along the beam to the field. Landing is accomplished by setting the plane on a line between two of these transmitting beacons, one about two miles distant from the airport and the other, one quarter of a mile. The pilot flies over the first and then sets his course for the second. When over the second a light flashes on his instrument board. The pilot then brings his ship down to a landing.

As yet, no blind flying apparatus has been put into general service which will allow the pilot to land without seeing the ground. This feat has been accomplished in experiments and it is expected that in the near future such apparatus will be put into use.

Another factor to be considered in the improved safety of flying is the advancements made in weather forecasting. Though this may not be immediately apparent from reading the forecasts in the local papers, it is possible to accurately predict the weather five days in advance. The pilot knows at all times the weather conditions that are ahead of him since he receives weather reports every thirty minutes. Still another invention to put Old Man Weather in his proper place is the deicer. In a sleet storm the deicer effectively prevents the formation of ice on the plane which would otherwise drag it down to a forced landing.

Inventors are not relaxing their efforts to make air transportation safer. One of the problems they are trying to solve at present is that of parachutes. If every passenger was expected to put on a parachute when entering a plane, there would soon be very few passengers. Furthermore, even if all passengers did wear parachutes, it is doubtful whether in an emergency they would have enough presence of mind to get out of the plane and pull the rip cord.

Various methods have been suggested for emptying the plane in an emergency. One is to attach a huge parachute to the cabin. In an emergency the cabin would be detached from the rest of the plane and float down to safety. Another is to divide the cabin into compartments and lower each to safety by the use of parachutes. The compartments would be thrown clear of the plane by springs operated by the pilot. A more practical system is to have the passengers hook a safety belt across the seat and then drop the entire seat through the floor. A parachute attached to the seat would open automatically.

With this increased safety in aviation has come increased confidence. This increase in confidence of the public will mean still further expansion of commercial aviation. Already commercial aviation has found the limits of continents too confining. As a result, there is keen competition to establish trans-oceanic routes. With the Graf making regular trips to South America, Germany has become the pioneer in this field. However, she has not been resting on her laurels. She now has a new zeppelin which she soon hopes to put into trans-oceanic service over the North Atlantic.

New Route Opened

The United States is very much in the trans-oceaanic race. The recent historic flight of the China Clipper opening up a trade route from the United States to the Orient is a story within itself. It is now possible to travel from Buenos Aires to Pekin, a distance of 18,000 miles, on one ticket. The trip from San Francisco to China can be completed in a mere sixty flying hours. When this flight was first conceived back in 1931, there was no ship capable of flying the 2,410 miles to Hawaii and arriving with a safe fuel reserve, much less flying it with a load of passenger mail, and express.

The job of building such a ship was turned over to Glen Martin and Sikorsky. The efforts of both men were marked with success. Sikorsky built a nineteen ton ship while Glen Martin built the twenty-five ton China Clipper. In these planes new and lighter materials were used as was improved radio equipment. In the routine acceptance test of these planes, the ten world records for seaplane transportation efficiency were brought back to the United States from Europe.

If Jules Verne were alive today, the title of his book would have to be changed to "Around the World in Eighty Hours" before he could sell a single copy in this fast stepping world.

Courtesy Aviation

Picture of Baby Clipper Ship to be Used by the Pan-American Airways for Passenger Service

SO YOU WANT A JOB

Hints on Job Hunting

By Gene Schubert '36

YES, you want a job. Whether senior, junior, or under-classman, the time is coming sooner or later when the matter of a job will become the most important thing in life, to say nothing of the utility of a job in maintaining life in a living body. You feel that the education which has taken four years of your life should now begin to repay you by enabling you to use it; the education is yours to use, but the opportunity sometimes is entirely a matter distinctly in another category, and very rarely is the job a product of education alone. There is no time when the native ingenuity of a man can be put more versatile use than in securing a job, but there are several standard fundamental rules of the game which will be detailed here to serve as a basis for the variations of the individual's characteristics and qualifications.

Personal Interview

Let us consider first the personal interview which graduates are commonly offered with the representatives of large companies who hire a number of youthful engineers yearly. As soon as you have been designated for an interview, begin to prepare yourself with the specific intent of impressing that personnel man with the idea that you have the knowledge and the ability to be an asset to his organization if given a chance. Large corporations or small companies are not interested in hiring men with educations only; the men who are hired have, in addition to the number of hours required for graduation, something to offer of themselves alone; at least, they have convinced their employers that they have. Go to the interview with a decent knowledge of the company which has sent its man here; know what the company makes and how they make it; acquaint yourself from current journal articles with the recent problems and advancements in the company's processes and products; be able to suggest some problem of the company which your training might enable you to pursue intelligently. Don't, however, give out a half-baked solution to a problem which puzzled experienced men for years; it is not expected that you know everything as a graduate, and to give the impression that you do fools nobody.

Personal Appearance

A word may not be amiss concerning the personal appearance of the man being interviewed, and his conduct during the period. Anent personal appearance, let it be the best possible from all standpoints. Clean, well-pressed clothes, a fresh shave, and a not too remote haircut are important details; others are shined shoes, clean and cut finger nails, and a straight tie. Courtesy is an important thing at any time; at this time, let it become a true guide of your actions; remember, you want that man to like you well enough to hire you—don't forget he is an important possibility for your future! Introduce yourself, if necessary, in a straightforward manner, and give your voice inflection when you speak. It is discourteous to mumble, and it is deceitful to talk without saying anything; don't do either. At the conclusion of your allotted time, take your leave at the first indication; thank the representative for his time, and accept anything he may offer you with appreciation verbal as well as spiritual.

Application Letters

It is not always possible to secure an interview with the firm which you desire to work for through the medium of the school. In this situation, it becomes necessary for the applicant to write a letter for the purpose of securing an interview at the company's plant or office with the man who has charge of the department in which he wishes to be employed. No more should be expected of this letter than the procuring of an interview; it should be remembered that this company probably is not in any immediate need of men, and most certainly will not hire a new engineer sight unseen, on the basis of a letter. Let us investigate to some extent the contents of the letter and the accompanying information which an applicant should send to a company for which he wishes to work. These suggestions are taken principally from an article by Professor A. D. Moore of the University of Michigan, who is in charge of the placement of men in the Electrical Engineering department there.

Likened to Technical Report

The document to be sent may be likened to a regular report of an engineering investigation, such as is commonly made in industry. Such reports always consist of a letter of transmittal, followed by the technical report itself. In carrying the analogy over to the application example, let the letter of transmittal become a letter of application, and the report itself a detailed personal record of you; in other words, an analytical biography in outline form. More of this report later; let us consider the letter more fully before proceeding. Some of you may feel you know how to write a compelling letter in a business-like manner; if you don't, then find out before making an attempt to secure a job by means of a letter. Some details that cannot receive too much emphasis are those of form and appearance; make these letter-perfect. Put the letter on $8\frac{1}{2}$ by 11 paper, or don't write it. Also, it must be typewritten. Do it yourself if you can do a flawless job; if not, have it done. The mechanics of the letter allow of no variations in grammar, form, or spelling. If you don't do these things correctly as a matter of habit, get the right books and do them right this time. In particular, spell correctly; small grammatical errors may slip by unnoticed, but a mis-spelled word is as prominent and thought-provoking as potatoes cooked without salt. The content of the letter is too broad a subject for definite rules, but there must be no trifling with its object. It must command the attention of the reader, and earn his respect to a great enough extent for him to grant you an interview for prospective employment. Think out carefully what you want to say in the letter, then say it concisely and in good form. Don't go beyond this unless you are a wonder at the letter-writing game, and can say more in good taste which will lend a personal touch to a prosaic document. This "extra something" is entirely to be desired, but if you can't do it properly don't render the whole letter ludicrous by a sloppy attempt.

The Data Sheet

The personal record which should accompany the letter is a matter for individual effort and design. Fulfill the above directions as to neatness and appearance, and make the arrangement in outline form, in such a manner that all the facts are easily found. The length of a personal history record may vary from one to five pages, depending on the amount of material in a man's life which comes under one of the following subject headings for the record. These subjects may be arranged in any order, but they should all be expressed to some extent in the report. Let us discuss them in short paragraphs.

Photograph and personal statistics. Standard application pictures are best for this; never use a newspaper picture, snapshot, or a bad photograph. Be careful to avoid creasing the picture in folding the document. Give personal data such as name, address, telephone number, date, age, place of birth, state of health, whether married, number of dependents, etc.

Affiliations. Memberships in honorary and professional societies are given.

Education and Training. Give the schools attended, with dates of attendance and degrees received. Advanced degrees are important, and any special training such as that obtained in an industrial training set-up should be given. All courses taken in college need not be listed, but a selected list which might be pertinent to a certain type of job would be a good inclosure.

Experience. Give all experience in any jobs which you might have held. Do not confine yourself to technical jobs. Your company may be looking for a man who knows something about one of the things you may have worked at as a laborer, and even a superficial knowledge may put you ahead of a competitor without that knowledge. Give every evidence available of your diversified experiences.

Activities. List your activities outside of your curriculum, such as class offices, memberships and offices in organizations, and similar information. This may be important to some employers, while others will disregard it entirely. Occasionally, some will object to it, but most employers will tolerate a certain amount, and many insist on it.

New Objects Planned, Designed, or Built. List and describe the gadgets which you may have thought of or built in your life. Distinguish between those projected and those actually built. Many employers are much impressed by a few successful gadgets which are the product of self-imposed activity.

Special Interests. The special things which may interest you should be given. Include those subjects of your curriculum which were of the nature which you wish to follow out of school. State also any other interests which you may have which are not necessarily of a scholastic nature, and in which you may have some information not common to your prospective competitors.

Preferences. Your preferences should be stated as to the type of job desired. This requires discreet treatment, but should be done, because an employer who is left completely in the dark may reciprocate and leave you in the dark also. If your preferences happen to coincide with his needs, they have served a distinct purpose. About three preferences should be listed; certainly, more than one.

References. Give as references one or more men you have worked for, and do not fail to include at least one member of the faculty, to avoid giving the impression that you left school in disgrace and do not wish your name brought up on the campus any more than can be helped.

The foregoing are the fundamentals of the job-getting game. Use your best talents and abilities in applying them to your own search for a job. Remember, an employer wants to be impressed with your mentality, maturity, ingenuity, and miscibility, so give him every opportunity to be, and await the result.

Best Wishes for your First Real Job!

Lieutenant McDonough Leaving in June

Lieut. R. K. McDonough, Associate in Military Science and Tactics here for the past four years, will be transferred for duty with the 5th Engineers at Ft. Bellvoir at the close of this semester. He is slated for captaincy in June. Lieutenant McDonough's place in the Engineer Corps here will be taken by Lieutenant Lothrop of Ft. Bellvoir.

Capt. A. G. Matthews was also due to be transferred this year, but he has been retained for another two semesters. The Engineer staff for next year will consist of Col. C. J. Taylor who came here in February, Captain Matthews, and Lieutenant Lothrop.

Freshman Engineers Make Phi Eta Sigma

Out of the 88 initiates into Phi Eta Sigma, freshman honorary scholastic fraternity, 22 were enrolled in Engineering. These men were selected on the basis of their last semester grades. An average of 4.5 is necessary to qualify. Those freshmen who were initiated are: Akemann, Richard W., Elgin; Carr, Maurice K., Avon; Chapman, Ira T., R. R. No. 4, Sumner; Cordes, John E., Rockford; Darke, Robert S., Lombard; De Wolf, Frank T., Urbana; Dugan, Warren G., Sugar Grove; Ericson, Roger K., Rockford; Farnsworth, George L., Ottawa; Filson, Charles W., Taylorville; Fraser, Edward S., Chicago; Gaines, Robert W., Urbana; Lucht, Fred, St. Louis, Mo.; Mollatt, Russel C., Sheldon; Morrow, Thomas M., Geneseo; Pascoe, William T., St. Louis, Mo.; Poarch, C. Kenneth, Decatur; Reeves, William, Denver, Colorado; Starr, Albert R., Peoria; Weers, Arthur F., Peoria; Zierjack, Robert L., Fairmount; Zuercher, Paul J. V., Park Ridge.

National Safety Council

Organization, Purposes Told

The increasing number of deaths from automobile accidents each year has reached such shocking proportions that the whole nation is striving to promote safer driving. Federal, state and municipal organizations are all cooperating in an effort to reduce this wanton destruction of life.

Leading the drive for greater safety is the National Safety Council. This corporation was organized soon after the close of the World War with greater safety in industrial plants as its primary object. Membership was chiefly institutional, the members receiving for their nominal dues safety publications and posters, and the benefits of accident statistics compiled by the council to show where the greatest dangers lay and means of eliminating or correcting these hazards. The council also promoted and passed legislation in many states providing protection for the worker. The more familiar examples are those requiring adequate covering for gears and moving belts.

New Divisions Added

The idea behind this organization caught on with such popularity that they added two more divisions, one for home safety and the other for public safety. It is under the latter's jurisdiction that the street and highway campaign operates.

The first step of the new campaign was to collect sufficient accident data to give a true picture of the motor vehicle problem. The compilation and analysis of this data was a long and laborious process, but the results showed clearly the principal causes of most of our automobile accidents. From these statistics the proper safety measures were devised to reduce street and highway casualties. These measures were put into effect in towns and cities willing and eager for a practical safety campaign. The results definitely proved the beneficial effect of an earnest, intelligent, safety drive.

In the early part of this year the National Safety Council embarked on a nation-wide campaign to reduce auto accidents 35% by 1940. Using the 1935 figure of 36,000 human lives lost in road mishaps as a base, 38,000 lives will be saved through the success of this campaign. The number of injuries will be proportionately reduced. In 1935 these amounted to 1,250,000—150,000 to be crippled for life.

Appeal to Motorists

The new campaign is introducing new ways of appealing to the individual motorist to arouse a sense of responsibility and sportsmanship. A definite school program will be recommended for each state, together with the organization of state and municipal safety bodies. Uniform laws, including standard drivers license legislation, will be urged with adequate administration and enforcement of traffic laws. Standardization of accident reports will be undertaken as a means of acquiring more complete accident statistics. The outstanding work already accomplished by some organizations will be made available as models for other states.

As a strictly educational feature of the campaign, drivers' clinics are being temporarily established in different towns to give motorists an opportunity to discover their faults and learn how to compensate for these faults in their driving. The physiological and psychological apparatus used has been developed within the last few years at Iowa State College. At the recent Illinois State Highway Conference several types of this apparatus were demonstrated.

Clinic Operated Here

The Chicago Motor Club, in conjunction with the National Safety Council, set up its regular drivers' clinic in Champaign from March 5 to March 7. This was the best opportunity the residents of the Twin Cities have had to inspect a complete "clinic," and to test their own ability as drivers. The ten different tests did not seem to be particularly difficult to the average motorist, but the number who were able to pass every test satisfactorily was comparatively small.

That the goal set by the five-year plan of the National Safety Council is attainable is shown through the fine safety programs of certain states and cities. Their evidence proves that the mounting number of motor vehicle tragedies cannot only be controlled, but actually reduced, provided that each individual driver does his utmost to drive carefully.

Tau Beta Pi Candidates

The formal initiation of junior engineers into Tau Beta Pi, all-engineering honorary fraternity, has been tentatively set for Sunday, April 26. Each semester, the outstanding engineers are selected by Tau Beta Pi and are extended invitations. The selections are based on several qualifications, among which are scholastic achievement, character and capacity for leadership.

The outcome of the entrance exams are not known at this time. Those who were extended invitations and who took the exam are: E. C. Adams, Min.E., J. C. Greider, M.E., E. H. Hough, Phy., R. L. Hull, E.E., F. Hummel, Cer.E., G. H. Logan, M.E., C. M. Milner, E.E., R. C. A. Purl, G.E., H. E. Skinner, C.E., J. W. Spalding, M.E., and R. Trachtenberg.

Engineers Honor Prof. Hardy Cross

Members of the civil engineering faculty at their March meeting paid tribute to Hardy Cross, professor of structural engineering, who recently received the Wason Medal "for the most meritorious paper of the 1935 proceedings" of the American Concrete institute.

In 1917, when the first Wason medal was awarded, it was an Illinois professor, A. B. McDaniel, who received it. Mr. Cross is the sixth member of the College of Engineering faculty to be thus honored.

Besides Mr. Cross, only one of these men, H. M. Westergaard, professor of theoretical and applied mechanics, is on the present staff of the University.

"Why Concrete Frames?", Mr. Cross' report was delivered at the annual meeting of the institute, February, 1935, in New York. It was reprinted in the following issue of the Journal of the American Concrete Institute.

Prominent Faculty Men Predict

Great Opportunities for the Class of 1936

Departments Place Many Graduates

THIS June will mark the graduation of about one-hundred and seventy-five seniors from the College of Engineering—graduation from the standpoint of the graduate. The time will have come when he must enter the world of affairs and prove how worthwhile his sixteen years of school training have been. To many a graduate facing the rebuffs of the world for the first time his education seems to have availed him little. When he discovers that his value to a company lies not in his past academic achievements but rather in the useful ideas which he can contribute to the organization, he should have no further difficulty in finding a job provided that he can supply these ideas. Here, he finds that education has given him considerable advantage; and he realizes that his diploma is not a passport, but rather a tool.

The University seeks to place as many of their graduates as possible by giving them the opportunity of being interviewed by the representatives from many of the country's largest corporations. The results of these interviews are by no means complete at present but the following will give some idea of the opinions of the department heads concerning the graduate's chance of securing employment.

Mechanical Engineering

The M.E.'s have been very fortunate since there are twice as many industrial concerns negotiating for men as there were last year. Professor Leutwiler states that every graduating senior has been interviewed, and at present about one-quarter of the class of forty-nine have been hired. Eighteen large industrial concerns have sent representatives while eight others are corresponding by mail. Three of the seniors have applied for fellowships to continue their studies; and all of the eight men who graduated in February are now engaged in engineering work.

Electrical Engineering

Professor Paine, head of the department of Electrical Engineering, says that, "Conditions for employment in the Electrical Engineering field are decidedly better than was the case one or two years ago. The evidence of this improvement comes through an increased number of vacancies brought to the attention of the department of Electrical Engineering, and also from an increased number of our graduates who report that they have succeeded in finding positions in Electrical Engineering after having spent some time in stop-gap positions. Definite offers have been made to some of the senior Electrical Engineering group. As a matter of fact, some of the 55 young men who will leave the University this June have already received several offers.

Word has been received from several sources that it is beginning to be rather difficult to find satisfactory candidates for engineering vacancies. In many cases companies needing men are still depending upon the chance that satisfactory men will make application. Such companies are not planning to send representatives into the field to hunt up candidates."

Chemical Engineers

From Professor Keyes of the department of Chemical Engineering comes the information that the chances of employment for the graduating class of 35 men are certainly no worse than they were last year. The group as a whole is better, and more alert than most of the classes during the depression. Practically all of the past year's graduates are now employed, and most of this year's class will be employed by direct contact with the companies rather than through the University. Seven of the group have applied for scholarships.

GRADUATES from the College of Engineering should be prepared to continue their education through self study. The Engineers' Council for Professional Development has prepared carefully selected Reading Lists for Junior Engineers which should be helpful in selecting non-technical education. To continue technical education and to keep abreast with technical developments, the graduate should join a national engineering society and study the articles in his field of work.

DEAN M. L. ENGER

Civil Engineering

Professor Huntington comments that, "The class in civil engineering which will graduate in June, 1936, has been a very excellent class. It has its full quota of outstanding men and all members of the class have cooperated with the members of the staff in a very fine way. Classes vary considerably from year to year even though it would seem that, with such large groups, the general average of the group would tend to be about the same.

Since there has been a very definite improvement in economic conditions, and since construction is showing a pronounced upturn, it seems certain that the members of this class will start their engineering careers on the rising tide of engineering activity and should advance rapidly.

Even during the depression years the employment of civil engineering graduates of the University of Illinois has remained at a very high level. Frequent canvasses have been made of the 700 men who have graduated with the last eleven classes. The largest number reported out of employment was in 1933 when there were 40 men unemployed. At the present time there are less than a dozen. If this condition is at all typical, the improvement in economic conditions which is now under way would appear to indicate a brilliant future for the civil engineering class of 1936."

Ceramics and Ceramic Engineering

To the seniors of the department of Ceramics the annual convention of the American Ceramics Society is the means by which they are able to contact potential employers. Practically every senior made the trip to Columbus, Ohio, this year and a good percentage obtained positions.

According to Professor Parmelee, this is the largest graduating class in years with about five ceramists and ten ceramic engineers. The class is superior in many respects to those of previous years, and with the marked increase in the glass, enamel and building industries, the prospects are very encouraging.

Engineering Physics

Professor Loomis states that nine men will be graduating in Engineering Physics. The classes are small due to the nature of the course and the graduates include some of the best students in the college. Three have been placed and two expect to continue with graduate work. All but two of the previous year's graduates have positions at present. Graduates find employment in the research division of such industries as General Electric, Du Pont, and General Motors.

Mining and Metallurgical Engineering

Professor Callen comments that employment in the mining and metallurgical industries is on the upgrade and he expects no difficulty in placing those graduating. The department follows the plan of placing its men, so far as it is able, in the type of work and at the location desired. At no time during the depression, according to the best of his knowledge, have more than two of the graduates been out of employment at any one time.

Railway Engineering

From Professor Schmidt of the department of Railway Engineering it was learned that six seniors will be graduated and it is expected that they will all find positions by June.

Magazine Reaches Its 50th Birthday

"New Deal" Technograph Welcomed

Many Changes Made in 1934

(Editor's Note: *This is the last of a series of articles recounting the history of the Illinois Technograph.*)

THERE were no issues of The Technograph in the years from 1918 to 1920. This lack of interest on the part of the students was most likely due to the general readjustment of the post-war years.

1920-1921—In the following year of 1920-1921, The Technograph was revived. The publishing was taken over by the Illini Publishing Company. It was to be continued as a quarterly, and the subscription price was forty cents a copy. The first issue under the new management had forty-eight pages.

Subscriptions With Memberships

Subscriptions to The Technograph were included in memberships to the various engineering societies. An interesting article in the first number, carried the news that President Willard was appointed head of the Mechanical Engineering Department, and Professor H. J. MacIntire was appointed assistant professor in refrigeration. The editor was George L. N. Meyer '21, and Fred W. Scheuman was business manager.

1921-1922—The 1921-1922 issue contained an article by Prof. A. C. Willard on "The Hudson River Vehicular Tunnel Ventilating Problems," in which President Willard described one of his best known engineering feats.

A humor page was introduced that year, called the "Once-Overs," which contained jokes, poems, and incidents in classes. Arthur J. Ingold, Jr. '22, was editor for the first semester, and Donald A. Murro '22, the second. Walter A. Mueller '22 was business manager both semesters.

The frontispiece of the fourth number was a picture of Professor Ira O. Baker, who retired at that time.

1922-1923—In the year 1922-1923, when Martin E. Johnson '23, editor, and Arthur B. Durham '23 was business manager, Prof. M. S. Ketchum was named Dean, and The Technograph carried his picture and a tribute to him.

This year also marked the death of Prof. Harry Harkness Stock, of the mining department, on March 1, 1923.

Stadium Described

1923-1924—The University of Illinois stadium was described in an article by H. J. Bart '96. A new column headed "Engineers in Activities," contained a picture of James W. McMilleen, the captain of the football team.

On April 4, 1924, the first "Engineers' Day" was held. Floats, a parade, and exhibits of the engineering college were held.

The editor in 1923 was J. Robert Walsh '24, Thomas L. Pankey '24, business manager.

1924-1925—The 1924-1925 issues, under C. W. Parmalee '25, and P. G. Dingledy '25, as editor and business manager, respectively, published pictures of Illini engineers in activities, after the lead of the previous year. One page was taken up by a column headed "Contemporary Engineering News," which was short articles describing new things in engineering.

1925-1926—The 1925-1926 Technograph recorded the death of Prof. Ira O. Baker, and printed his picture and obituary. Prof. Baker was with The Technograph at its founding. Pictures of Illini Engineers in activities were put into that year's issues also. These pictures should prove interesting to those who would like to recall those years.

Picture of T. J. Dolan in May, 1929, Technograph

The editor in 1925-1926 was H. A. Vaglborg '26, and the business manager was S. I. Rottmayer '26.

1926-1927—The 1926-1927 issues marked the death of two of the engineering faculty. They were John McBeath Snodgrass, and Bruce Willett Benedict. The editor and business manager were J. O. Ephgrave '27, and R. H. Landon '28.

1927-1928—The Technograph won several awards, at a convention of the Engineering College Magazines, Associated Convention. To quote from the 1927-1928 Technograph, "At a recent convention of Engineering College Magazines' Association, composed of twenty-one undergraduate magazines, The Technograph total of awards was second best. E. A. Buckwell's article, "Glimpses of South America," was awarded second best student article. The magazine was awarded second best in student articles and second best in cover design."

New Building Planned

The Materials Testing laboratory was planned that year, and a description was printed in the 1927-1928 Technograph.

The editor in 1927-1928 was E. A. Todd '28, and C. A. Gebhardt '28.

1928-1929—The 1928-1929 issue, when C. M. Burnham '29 and W. R. Berry '29 were editor and business managers, was a little larger than the usual Technograph, since it contained 250 pages while the usual size was about 200 pages.

Among the "Engineers in Activities" pictures was a picture of Mr. T. J. Dolan, who was Senior Circus manager, and a member of Tau Beta Pi and Theta Tau.

1929-1930—The year 1929-1930 was marked by the death of Professor George A. Goodenough, and The Technograph printed his picture and obituary.

The Materials Testing Laboratory was finished that year. The editor was J. W. DeWolf '30, and the business manager was G. Mackey '30.

1930-1931—In 1930-1931, with Don Johnstone '31 as editor and Kenneth M. Laird '31 as business manager, The Technograph launched itself as a monthly magazine. Six issues were printed, of thirty-two pages each.

1931-1932—The next year, 1931-1932, under J. B. Tiffany, Jr. '32, and W. J. Everhart '32, the magazine continued as a monthly. Credit was given to the 1929-30 staff for its work in establishing The Technograph on a monthly basis.

The 1931-1932 Technograph also carried news of The Technograph tying for first place in the number of awards received at a convention of Engineering College Magazines' Association, with the Iowa State Engineer.

Magazine Wins Awards

The Technograph won first place for best editorial of year, and first place for best single editorial. Also second place for best cover series, first honorable mention for best single editorial, and second honorable mention for best student articles.

1931-1932—The 1931-1932 Technograph continued as a monthly. The editor was J. B. Tiffany '32, and W. J. Everhart '32, was business manager.

1932-1933—The 1932-1933 Technograph published seven numbers. The editor was Randall A. Forsberg '33, and the business manager was A. E. Wanderer. Number four contained a picture of James McLaren White, who passed away on February 8, 1933.

1933-1934—The 1933-1934 Technograph returned to being a quarterly. The reason for the change was given in an editorial as, "larger and better issues will be able to be prepared as a result of the change. In other words, we are hitting at a motto of four big issues."

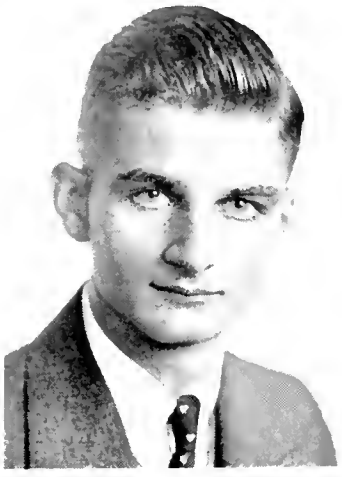
New Deal Technograph

1933-1934—The year of 1933-1934 will long be remembered in Technograph history, as the year of the "New Deal." Not Roosevelt's New Deal, but The Technograph's New Deal. The Technograph policy was, as quoted from the

(Continued on page 16)

• WHO'S WHO IN ILLIN

• *C. B. Graham*



• *J. H. Stein*

• *R. W. Cline*

CLIFF GRAHAM has every reason to be a very happy senior. From most reliable sources, we hear that he is going to leave school in June, tie the so-called "knot" with the girl of his dreams, and move to Rochester, New York, where he will occupy the place which the Eastman Kodak Company is now saving for him. It's not every man who has both a job and a home waiting for him when he graduates—congratulations, Cliff! Peoria, Illinois, is Cliff's port of call as well as the site of his alma mater, Bradley Polytechnic Institute, before he transferred to the M.E. school here. At present, Cliff is is the president of Pi Tau Sigma and a member of Tau Beta Pi, so you see he's done right well by himself on this campus. The Alpha Tau Omegas help him keep up his social prestige, not to mention his physical condition in the daily walks out to their "pea patch" on south campus. Until finances changed his interests, Cliff and his speed boat were inseparable.

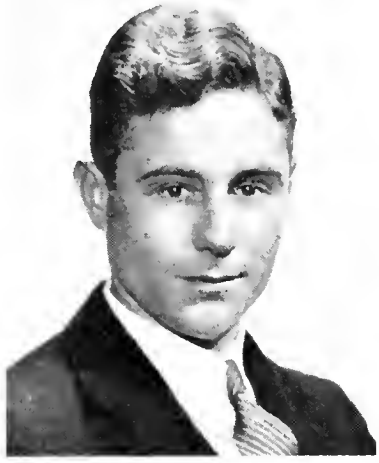
JIM STEIN is another of our versatile engineers who is not only an excellent student but an activity man as well. This year he has the position of manager of the stunts for the E. E. show. He is a member of Phi Eta Sigma, Tau Beta Pi, and has been both recording secretary and president of Eta Kappa Nu. Jim has been a very valuable asset to the Technograph editorial staff this year. Jim is also a circus man. Last year he won the second prize for the most versatile of the performers in the show. As an aid to keeping the expenses of his college education to a minimum, he has been working for the University for the last two years in the E. E. estimate room and grading physics reports. When he entered the University he got a head start in credit hours by passing the proficiency exams in G.E.D. 1, and both of the freshman rhetoric courses. Jim has it handy to come here to school since his home is the Twin Cities. His hobbies are tennis and chess. When he graduates this spring, he hopes to land a job with one of the big electrical concerns.

BOB CLINE is one of our examples of good students. He is a senior ceramist who transferred from Blackburn College last year to enter the ceramic school as a junior. At Blackburn, Bob distinguished himself as a freshman by winning a prize for the best student in inorganic chemistry. He also managed the lightning effects for some Shakesperean plays which were given there. Since he arrived at Champaign, Bob has engaged in the activities of Tau Beta Pi and Keramos He has a mania for amateur radio and is naturally a member of Synton. For practice he works on his station located in the basement of the AOPi house, where he lives. He also has a station at his home in Peoria. Along with radio, stamp collecting takes its place as one of his hobbies. In addition, Bob has been working for the NYA in the chemistry lab under the direction of Dr. Krase, on research on the physical properties of compressed gases and on chemical reactions at high pressures. After graduating, Bob hopes to continue with specialized study on enamels.

Norman Schoeppel has taken it upon himself to prove that a farmer boy can develop into an engineer who is just a little better than the cities produce. Last semester he was the one junior to be elected to Tau Beta Pi. His scholastic standing has been such as to warrant his receiving college honors last year on honors day. He is a ceramic engineer and the secretary-treasurer of Keramos. Also, he belongs to the student chapter of the American Ceramic Society and Phi Eta Sigma. Wesley Foundation with its activities also claims a share of his time. During the summers, Norman takes over the job of carpenter and "Handy Andy" at his parents' home in Ellis Grove. Remodeling the house seems to be his specialty. When he has any time at all for a hobby, he likes to get in a workshop and construct and experiment with home made machinery. For exercise, Norman enjoys a good workout of tennis or handball the best. When work gets to be too dreary, he enjoys a good show or dance and is ready to hit the ball again.

From Blackburn College comes C. Burton Clark who is a senior ceramic engineer this year. Burton's home is also near Carlinville which makes Blackburn—and Illinois as well—handy schools to attend. Back at Blackburn he distinguished himself as a freshman by winning a prize offered by the chemistry department for freshman scholarship. He was also the president of the chemistry society of that college. He transferred to Illinois with a junior standing and has since been distinguishing himself on this campus. He is doing his best to keep order at the Keramos meetings by virtue of the power vested in him by the office of herald. He is also a member of the student branch of the American Ceramic Society. Recently he has become interested in amateur radio and has passed the exam for pledgeship in Synton.

ENGINEERING WORLD •



C. G. Austin •

J. D. Taylor •

F. C. Heinig •

FRITZ HEINIG was chosen to represent the mechanical engineering department in the race for the honor of being St. Pat at the recent St. Pat's Ball. He tied for second place in the balloting. Fritz is a senior, "sheckel guard" for the student chapter of the A.S.M.E. He is prominent in campus military circles, being a major in the Engineer Advanced Corps, and historian for Phalanx. Last semester, he served as vice president and pledge boss for Tau Nu Tau, honorary Military Engineering Fraternity. This semester Fritz is president of Tau Nu Tau, and serves them as their representative on the Military Council. His good work on tbe ticket committee of the recently held Military Ball was a big factor in the perfect presentation of the dance. For relaxation after a hard day, Fritz likes to play a good game of golf or tennis, but he says that his chief recreation is catching up on lost sleep. The one and only girl of his affections is a coed at Northwestern. Fritz hasn't any job definitely lined up as yet, but he hopes to land something soon in machine design.

DON TAYLOR has distinguished himself as a scholar and a leader since the day that he arrived on this campus almost four years ago. He garnered three credit hours right off the bat by passing his rhetoric proficiency. Work in his other freshman subjects was of high enough quality to gain for him membership in Phi Eta Sigma. Somewhere along about this time, Don got married. Strangely enough, he continued to crack out high grades. Up to date, he has hit 5 point twice, and has been on the honor's day program three times. He is a member of the A.S.C.E., Tau Beta Pi of which he was treasurer, and Chi Epsilon, which he served as president. Don does a good job with the finances of the Triangle house where he stays between week-ends. Saturday almost invariably finds him with grip in hand, headed for Springfield. In addition to his heavy C.E. schedule, Don has for the last two years attended to the duties of lab assistant in the concrete and bituminous lobs.

GEORGE AUSTIN is not only an engineer of smells (chemist to you) but an engineer of music. He plays the baritone saxophone in the concert band and he really makes that squealer speak! He is a member of the engineering council and also the president of the American Institute of Chemical Engineers. As the subject for his thesis he is using, "The Catalytic Conversion of Sulphur Dioxide to Elemental Sulphur with Natural Gas." When he gets a chance to recreate after putting in his time for sleeping at the Alpha Chi Rho house, he likes to exercise by playing tennis or handball. During the summer of '34 George went to Northwestern where he said loafing and having a good time were his chief occupations. He is another small town boy, coming from Salem, Illinois. His Hobby is his work, with a little specialization on cosmetics thrown in. It is probably his fiancee who is the one mainly interested in the fruits of his labor, but then you can't blame him. What can he do? After graduating, George hopes to get in the oil refinery business.

Schoolteacher, soldier, athlete, and student — Charles Proutt! In other words, an all around fellow is the said person who is now a senior C.E. specializing in structural work. With the usual tough grind as an engineer, Charles, faithfully pursues his hobby, "sleep" in every place that he happens to be. Well known to the senior C.E.'s itse famous Proutt's Problem which had its origin in an hour of inspiration during one of Professor Cross' classes. With such momentous things as this on his mind, Charles still finds time for A.S.C.E., Tau Nu Tau, and Palaestra, a wresting fraternity, of which he ispresident. His "I" sweater adorns the north campus showing that engineers are versatile creatures indeed. As an actor, Charles does his stuff over at McKinley Foundation. Last June he was awarded his commission as second lieutenant in the O. R.C. Two years ago he spent his time teachiing grade school in his home town, Harrisburg, Illinois. What his future holds for him he does not know. It may be (in order of preference) Randolph Field, graduate work, or——?

Another busy junior C.E. is Elmer Olson. Naturally he is a member of the student chapter of A.S.C.E., and in addition he is a member of Pershing Rifles and holds the position of treasurer for Tau Nu Tau. Last year he received the T.N.T. award for being one of the ten best drilled sophomore engineers. At home, Bellwood, Illinois, he played on the high school football and basketball team. Now, when he has a little extra time to get some exercise he enjoys a good game of basketball, baseball, or golf. Elmer's meal job at the Phi Mu house and the janitor work at the Union complete the filling in of his schedule. For the past three summers Elmer has worked as a bridge carpenter for the Chicago and Northwestern R. R. This coming summer he plans to work with them as a rodman.

THE RIGHT ANGLE . . .

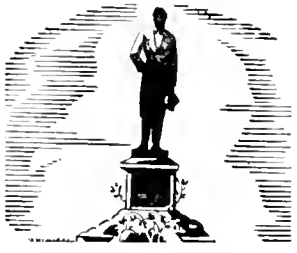
Organization

Unless one is a licensed practitioner he cannot treat you for illness. The man who pleads your case in the courts must be a member of the bar licensed to practice law. Skilled artisans jealously guard their positions in the build-building and allied trades by the organization of unions. Organization seems to be the word of the hour and while much can be said for and against it, without a doubt organization is the answer to keeping intact the skilled bodies of workmen in these times of a almost murderous competition.

It seems that the engineering profession has been a long time asleep, or shall we rather say that they have disdained to stoop to organization, trusting to their own omnipotence to expose those who have unfairly placed themselves in the engineering ranks. This will not do! Employers have never been scrupulous and in these times it is extremely unlikely that they are changing.

It seems that the answer is organization. No other profession or trained body of men permit such indiscriminate and promiscuous usurping of their position. Moreover, they cannot afford to do this. It lowers the standard of the profession. Why should some spend their time and money on their apprenticeship if their work is to be judged by the standards of those who have neglected this preliminary training. Then—the ultimate objective is a job. This is of vital importance and with this unfair competition, if it may be called such, the chances are minimized.

Do not treat this lightly or shruggingly think that this does not apply to you as an individual. As stated above, it is of vital importance and again—organization seems to be the answer if engineering as a profession is to endure. Support it at every opportunity! —J. D. T.



Responsibilities

For a long time the engineer has set the pace for social changes. Upon him his fellow men have largely depended for the leadership and ability that brings a society to new heights of material welfare. One may ask, however, if mankind is happier or better fed than before the development of certain power project or array of automatic, labor-saving machinery. Has the engineer anticipated and attempted to provide for the various contingencies arising out of the application of fruits of his endeavors to the modern, highly complex community? You may say, and with some truth, that it is not the engineer's part to say how or when or where his machines shall be used. But this attitude is no longer an entirely valid one. It suffered when mechanized industry and society were in their infancy, when there was an abundance of work to be done and fewer machines to do it, when there still existed the opportunity for national internal expansion, but it is no longer adequate nor justifiable.

The social and economic demands of the future are too imperative—men have become too interdependent for a responsible group to disregard the social effects of a further step toward a more highly mechanized civilization. Surely the engineer cannot view with equanimity the disturbed conditions of our society throughout the past few years.

It appears that the engineering profession, as a highly respected and capable group, could exert a moderating influence on a society whose machines have gotten out of control. It becomes quite logical to think that the engineer would represent a strong stabilizing force in a forward movement of society if he were to judge his acts in the light of a philosophy which had its roots deep in a sympathetic understanding, in a genuine desire to perceive effects in terms of human factors as well as scientific ones.—C. M. M.

On Inertia

Inertia, a word of great technical importance, finds many applications in the student's personal life.

Mental inertia is a serious malady. After being afflicted by the disease, the initial suffering is usually a pleasure. Very few people can truthfully say that it is not a pleasure to sit down after a satisfying evening's meal and go to sleep over a book. A delicious drowsiness enfolds and carries one away upon a delightful journey—but then the awakening! A look at the clock is convincing evidence that most of the evening has slipped away; the next stage is usually a serious relapse. Just as conscientious studying begins, a feeling of personal abuse becomes dominant. This precipitates the original intention; the book is slammed shut and soon you are comfortably stretched out and asleep!.

The process described may not be applicable to everyone, but it does suggest a personal checkup. The ability to sit down and study effectively at will is not an accomplishment of which everyone can boast. What are the principal enemies militating against the ambitious student?

Mental inertia's boon companion is lack of interest. The difficulty in reading and understanding page after page of dull literature that neither stirs nor excites the imagination is appreciated by every student. Consequently, little is derived from the particular course. And what is worse, a susceptibility for mental lethargy is developed.

Next in importance comes self-pity. No sooner a person begins to feel sorry for himself, than he loses his point of view. It is very easy to forget the purpose for which you are spending time and money here at school. As individuals, it is very easy to recapitulate your grievances against the world. Accompanying this mental attitude, is a definite amount of pure laziness. Once more the student is confronted with a serious problem. What is the solution?

Early in his career, the student should formulate a definite goal towards which to work. A reasonable allowance should be made for recreation. Granted that the engineer is a highly developed technician, yet he should not lose his philosophical attitude towards life. He should secure the work that interests him and then combine his efforts to produce that efficiency he so often calculated in his different courses—a minimum of effort with a maximum of output! —R. Z.

Campus Snapshots —

It is rumored that Tom Morrow and Johnny Grubb were spotted in the balcony at the last Interfraternity dance following Ina Ray Hutton's every move with a transit. When questioned regarding their strange conduct, they claimed to be locating curves.

Charlie Prout shows great promise as a designer of locomotives. At least he has a few novel ideas on the loadings. He spent half an hour at the blackboard in Professor Cross' C.E. 68 class drawing pictures of trains that looked like everything from baby carriages to June Bugs with wheels. Professor Cross has made it possible for even a kindergarten child or an L.A.&S. student to get at least a C in the course. If the third figure in the answer to any problem is correct, it is worth a C, and he has made it simple by ruling that the third figure in any problem in his course is 7. Take heart, Charlie.

Claire Carlson '37 has a neat little trick. It seems he has a season ticket to the Park, and in order to get the most for the outlay he dances regularly on Friday and Saturday, not with the same girl, for he has his "Friday Nighter" and "Saturday Nighter." Claire when consulted about this strange procedure said:

"Shucks-a-mighty, a body has to be careful so's the gals won't get too tired of the place too soon."

Here is a prize, fresh from the Wednesday 3 p. m. T&AM 63 class. Instructor Schwalbe was emphasizing some of the properties of concrete and asked for a few examples. A brief meditative silence ensued until a certain Civil came across with ductility as his contribution.

Carl Rohde, one of the better ME's and the owner of that roaring roadster occasionally seen around the campus, is a ladies' man of the first order. His hobby and occupation when not cutting classes is hairdressing. He invites all Engineers interested in a hair set to see him. If closely pressed, Carl reluctantly admits he is a student of the pseudo science, Phrenology, of which hairdressing is a special subdivision.

We note with much satisfaction that the engineer's pet gripe, the old board walk south of the M.E. Lab, has been repaired so that it is now almost walkable. The story is told of the Freshman who in hurrying to his GED class, was hit in the face and knocked into the beautiful babbling brook when he stepped on the loose end of a board. He was saved from drowning by the quick response of one of the firemen to his frantic call for help.

Seen at the St. Pat's Ball, Curt Talbot and one of the very good looking E.E. secretaries. Seen in Hanley's, Talbot and the same secretary. Seen at the Mil Ball, Curt and same. Seen—Say what is this!

Two of our very prominent sororities have written to national headquarters for permission to pledge male students. They figure that two of our budding engineers are over at their houses so much of the time that they might as well pledge them and get some good out of it. The cases in question are those of Johnny Buck at the Kappa Delt House and Harold Goeke over at Alpha Chi Omega.

Several engineers have gone into the importing business. We venture to say that most of them went bankrupt. Among those seen impatiently waiting for the train from Chicago on the night of the Mil Ball were Kunzer, Skorez, Weldon, Groth, Lynch, McGuire and Elden.

W. H. Blackburn is never to be found at home nights any more. If you desire to see him, get in touch with him during the day, when he isn't in conference with his fiancee.

Harry Piper, E.E., has built himself quite a reputation for furnishing the "top" in dance music to frats and social organizations. His collection of popular recordings is probably one of the most complete on the campus, and he has the equipment for reproducing it to the best advantage, besides. Practically every hit song of the past several years is included in his list.

In moving a train across a span, a certain instructor insists that the boys in his C. E. 61 class have a tender behind.

"I wish I was in Peoria!" That has been the tune of Jimmy Stine for the last six months. But the Engineers' Saint Pat's Ball finally brought him out of it, and he turned up with a date. What will Louise (in Peoria) say, when she hears of this?

Has anyone an explanation for Rex Newcomb's sudden desire to learn to tap dance? Twice each week he goes out to the New Gym and flings his hoofs for half an hour. The mystery becomes evident when it is disclosed that he does not need the P.E. credit; in fact, he is taking the course "no-credit." Since he is so well proportioned physically, this could hardly be a reducing exercise. Can it be that Rex is preparing himself for a stage or movie career?

St. Pat Ed Post put one over on the boys at the St. Pat's Ball when, asked to say a few words after being crowned St. Pat by Professor Crandell, he responded with, "Don't forget the E.E. Show on April 16, 17 and 18." St. Pat has forsaken Ireland to chase around in Urbana on moonlit nights. She lives on West California.

Brand new "I Men" seen on the engineering campus: Blum Howell and Prout, wrestlers; Hackett and Huntley, track; Ringquist, football, and Silverman, fencing. Congratulations!

Writing letters to the girl at home and telling her that you are going to "Stay home and study tonight," or that you are "Going to a show with some of the fellows" often arouses suspicion in their minds. An intensive search sponsored by The Technograph has at last revealed a fellow who writes to the girl and says:

Dear Mary:

I am going to the St. Pat's Ball tonight with a wonderful girl. I have just met her; her name is Jean Campbell. I haven't time to write a longer letter right now. I hope you understand, dear. As ever,

Your Little Walter (Beattie)

P. S.—Write again soon—W. B.

Reports have it that a certain ADPi has really fallen for engineer Bill Sloat. It happened on Green Street while Bill and his date were making a mad dash from Hanley's to the Park one cool Saturday night. Bill got around one of the slower couples all right, but the date took a tail spin. One ADPi ate meals from the mantel for a week.

Interesting Faculty Facts

Discovered in Technograph Interviews

Dean M. L. Enger

Dean Enger granted the Technograph this meager sketch of himself only after he had of necessity undergone a quarter hour of earnest beseeching. On the obviously logical premise (which he stated in so many words) that a college dean can have no pet peeves, he at first thought it unfitting that he try to aid this publication in its attempt to get into print "the human side of the profs." However, he was finally prevailed upon to give us some personal history and opinions; he did so carefully, but genially.

The dean-to-be was born in Decorah, Iowa, in the '80's. He attended our own dear alma mater, where he received the following degrees: a B.S. in Civil Engineering in 1906; a degree of C.E. in 1911; and an M.S. in 1916. He was married in 1908, was in the Bridge and Building Department of the Chicago, Milwaukee & St. Paul Railroad during 1906 and 1907, and in the latter year joined the staff that is currently engaged in guiding the struggles of Illini engineers. Here he has progressed as follows: He was an instructor in theoretical and applied mechanics from 1907 until 1909; an associate from 1909 until 1911; an assistant professor from 1911 until 1917; and an associate professor from then until 1919. In 1919 he was made Professor of Mechanics and Hydraulics. From 1926 until 1934 he was head of the T. & A. M. department, and in 1934, of course, he assumed his duties as dean of the college and director of the experiment station.

Experiment Station Explained

In a brief synopsis of the organization and current work of the University of Illinois Engineering Experiment Station, Dean Enger brought to light some points little known to the student body in general. The station was the first of its kind; it has been widely copied, but is still pre-eminent in the field. Although it is now customary for the offices of dean of the college and director of the experiment station to go hand in hand, they were formerly distinct, and were joined for administrative reasons. The whole of the college, from the spectacular Materials Testing Laboratory to the most obscure work shop, is the experiment station. The station has a staff of more than 60 persons, and any member of the faculty may be actively engaged in research. To date the station has published 280 bulletins and 25 circulars. An interesting development of the experiment station is the growth of cooperative investigations in recent years. During the past ten years, for instance, the station, in conjunction with several other universities, has been conducting tests on cast iron pipe and fittings.

Has Many Affiliations

Many an Illini can claim at least some connection with the dean, for he is a member of Tau Beta Pi, Sigma Tau, Chi Epsilon, and an honorary member of Triangle. His other memberships include the A.S.C.E., A.S.T.M., S.P.E.E., the American Water Works Association, Chicago Engineers Club, Western Society of Engineers, Illinois Society of Engineers, Sigma Xi,—ad (nearly) infinitum.

Some shots at random give us a further idea of the dean as a person. He feels ultra-specialization as an undergraduate is unwise, doubting the wisdom of the youth who comes to college **knowing** he wants to study nothing but Diesels, for instance. For this reason, the dean strives to keep the majority of the courses fundamental in nature. He mentioned that he played a bit of football in college; and that he has a son and a daughter; and that college activities are important, it being unwise to overdo them, but equally unwise to underdo them.

Professor Hardy Cross

Professor Cross said he would "jot down a few notes" on which to base this little sketch of himself. On a perusal of the jottings, this scribe found himself entirely unable to improve on anything about them except their inherent over-modesty. Result? The following will be composed of frequent quotations, spaced by those facts, omitted by the professor, which could be gleaned from outside sources.

Professor Cross was born on a Virginia farm in 1885. At Hampden-Sydney College, a small Presbyterian college dating from the revolution, young Mr. Cross received an A.B. degree in 1902 and a B.S. degree in 1903 (the professor neglected to state that "valedictorian" should be appended to the A.B.) From 1903 until 1906 he taught English and science in a Norfolk, Virginia school. In 1908 he received a B.S. degree at "Boston Tech"; in 1911 he was awarded an M.S. degree at Harvard. From 1911 until 1918, Mr. Cross, as an assistant professor, taught civil engineering at Brown university—and here begins the quotation from the graphic jottings: "Taught Professor Sheld there, which is why he's such a good man. My most important accomplishments are teaching men like him." Mr. Cross was in private practice for the next three years, chiefly in structural engineering, somewhat in hydraulic engineering and valuation. It has been "Professor" Cross at the University of Illinois since 1921 (the professor was married in that year, too).

Uses Technograph As Text

The following speak for themselves: "Principal theory of education—that it's not as complicated as it seems because nothing could possibly be so." Or again: "Opinions on what the world needs today—very vague. I accepted the world some years ago." Here's a case in point: "What's the matter with students? They are young and nearly always outgrow that if they live long enough. Wish I were young!" Here's a positively unsolicited local compliment: "General opinion of the Technograph—very high. I use it as a text in C.E. 68. Ask Bill Hendricksen if I don't."

Professor Cross is a member of Tau Beta Pi, Sigma Tau, and Chi Epsilon; also of the A.S.C.E., the S.P.E.E., and various and sundry other organizations. Concerning his publications, the professor says: "Some books and articles the meaning of which shall remain my secret."

Joys and Aversions

The jottings yield a further, but all-too-brief, insight into the traits and views of their author. Professor Cross claims that sitting on sandhills looking at the ocean is tops as a chief joy in life. His pet aversions are complicated formulas, radios, and spinach.

A final quotation leaves us with a more serious thought: "What the University of Illinois needs most—to wake up to its own greatness."

New Deal Technograph

(Continued from page 9)

advertising circular, "A sort of news magazine or house organ for the boys north of Green Street; lots of news and personal items, plenty of names, interesting and entertaining, new features in every issue.

The biggest historical event of the year 1933-1934 for the college of engineering, as recorded by The Technograph, was the election of acting Dean A. C. Willard to the office of president of the University.

"The New Deal" editor was Joseph A. Pask '34, and the business manager was Fred E. Strouf '34.

1934-1935—The year of 1934-1935 kept up and improved upon the fine work started by the new deal. Under Walter M. Enger '35, editor, and William W. Coffeen '35, business manager, the articles were almost all of a newsy and interesting nature and the reports of the departmental societies and honorary fraternities were plentiful. Who's Who, which was inaugurated the year before, was continued as one of the most successful features. It contained pictures and writeups of the most prominent of the engineering students in studies and activities. "Campus Snaps" was a page of remarks about engineers' doings in and out of school, such as, the first number told of the summer activities of many engineers.

Scholarships and Fellowships Awarded

W. A. Depp, E. E. senior, has been awarded one of the seven fellowships given to outstanding engineering graduates by Tau Beta Pi, national honorary engineering fraternity, each year. Depp competed with applicants from universities and colleges throughout the nation. He is the second Illinois man, and the first Illinois Electrical Engineer, to win the award since it was established a few years ago.

The fellowship permits one year of graduate study at any institution in the country. Depp will return to Illinois next year for work under Dr. J. H. Reich in the field of vacuum tubes. Considered in giving the fellowships were scholastic record, achievements, and promise of success in graduate work. Depp has been a straight five-point student since his transfer here at the start of his junior year from Illinois State College.

Others given scholarships for graduate work here next year are R. C. Hieronymus in civil engineering, and E. P. Carter and H. J. Sprengel in physics.

Engineers and Signal Corps to Camp Custer

Engineer and Signal Corps juniors in the R. O. T. C. Advance Corps will go to Camp Custer at Battle Creek, Michigan, for a six weeks' training period starting June 18. Attendance at one summer camp is a requirement for a commission in the Organized Reserves after graduation. The Signal Corps has in previous years received its training at Ft. Sheridan.

Signal Corps men going to Camp Custer this summer are: K. C. Suhr and E. C. Sawistanowicz, seniors, and H. W. Bond, R. G. Clay, K. DeWolf, A. A. Dyson, E. Hong, K. J. Kirsten, R. K. Little, D. F. Marston, J. J. Martan, H. D. Townsend, and T. Woltanski, juniors.

The Engineers are: J. W. Boyd, A. A. Carrara, and J. J. Mackland, seniors, and E. C. Adams, J. V. Anderson, S. H. Arthur, R. K. Bauerle, J. R. Bingham, A. B. Bourgo, C. E. Campbell, T. P. DeWan, E. A. Dixon, N. S. Eilertsen, W. R. Elden, H. D. Evans, W. R. Fay, V. B. Ferguson, M. C. Fritz, D. D. Godfrey, N. C. Grimm, T. N. Hackett, M. J. Hered, O. Houchin, R. Huxman, C. E. Johnson, G. H. Jones, H. H. Kern, A. J. Kush, M. E. Lamb, B. O. Larson, K. Lindley, L. H. Lipscomb, G. H. Logan, D. E. Loomis, F. Marich, C. M. Milner, E. H. Olson, F. H. Poppenburg, A. K. Porter, R. C. A. Purl, J. Reid, W. Renner, R. B. Shanks, M. B. Seigel, E. Simonds, H. E. Skinner, B. K. Slonneger, W. M. Turner, W. Walsh, R. W. Weldon, and M. H. Whitehead, juniors.

News of Scientific Achievements

Rapid Advances Being Made

A New Cheek on Renovated Car Cylinders

Methods of checking upon the garage mechanics who rebored car cylinders have, in the past, been incompetent. Many of the jobs turned out proved to be more of a detriment than a benefit. A freshly bored cylinder is rough and needs expert honing. Elimination of the honing operation results in a change of the initial and lon-time year, increases the oil consumption and causes a general motor depreciation. The physicists of the University of Michigan, Department of Engineering, have devised a "profilograph" which accurately detects roughness in the smoothest appearing surface. A delicate diamond-pointed finger records the irregularities which hitherto have not been satisfactorily measured. Even mirror-smooth finishes of new cylinders show pronounced distortions when subjected to the test. E. J. Abbot, research physicists, suggests that mechanics secure sections of cylinders whose smoothness has been previously determined and use them for a comparison with the job they turn out.

New Nine-Lens Camera

A new nine-lens aerial camera will make the present national mapping program a good deal easier than has been anticipated. The camera, mounted with nine vertical F 1.0 lenses, stands 38 in. high and weighs 636 lbs. ready for use. Its automatic control and low operational costs add to its effectiveness. An expert and lengthy laboratory procedure by which photographs are assembled into mosaics in accordance with the ground control points, is facilitated by the elimination of radical line plot adjustments. Working from an altitude of 30,000 ft. above sea level, the camera covers about 600 sq. mi. at one exposure. Since it has only one film, there is but a single transforming process necessary.

The camera consists of three main sections. On top is the film magazine and operating mechanism. Below this is the chamber containing the nine vertical lenses, and underneath that are the eight astronomical type mirrors, one for each of the wing lenses. Individual electric motors actuate the shutters ,assuring simultaneous operation. The negative is 23 in. square while the composite prints made from this negative are 35 in square. The camera is equipped with an automatic telescopic sight. Hair lines forming the grid determine the plane's "drift" and serve as a means of keeping the camera turned to the right degree for compensation. A moving wire over the grid area automatically operates the switch controlling the shutter action of the camera.

New Test Series For Rigid Frame Bridges

Series of tests in structural hinges for use in rigid frame bridges have been started at the Materials Testing Lab.

The work will be a continuation of the tests that have been conducted during the past year by W. M. Wilson, research professor of structural engineering, and F. E. Richart, research professor of engineering materials.

"In the new tests we propose to study the effectiveness of hinges of six or seven different types," said Richart.

"Some of these hinges have been used in bridges in Europe. Comparatively few have been used in this country. The rigid frame bridge is a rather new type of this highway bridge."

Beg Your Pardon

Our attention was called to an error in the February issue of The Technograph in which we stated that a new $50,000 Mining Laboratory would be started soon. The new lab will be a Metallurgical Lab instead of a Mining Lab as stated.

—Courtesy Scientific American

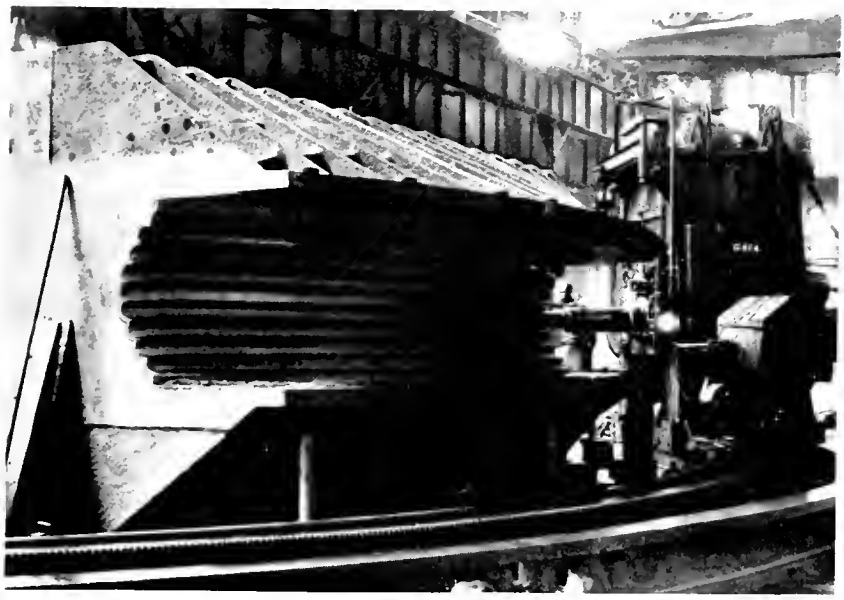
University of California Earthquake Apparatus

Earthquake Reproduction

A recent development at the Massachusetts Institute of Technology is expected to reveal much concerning the reactions of structures to destructive earthquakes by duplicating the earthquake motions directly from the seismograph records. The picture shows the machine duplicating the actions of the Long Beach, California, earthquake of 1933. An electric eye serves as the connection from the shaking table holding the model to the duplicating device. The driving mechanism, consisting of an oil-actuated piston moving the table under the control of a very sensitive, quick-acting valve, can be seen in the background. The model, although only 5 feet high and containing 10 pounds of water, shows what would have happened to a full-size structure of like design in the Long Beach earthquake.

Giant Saddles Used to Support Golden Gate Bridge Cables

The picture showing the milling machine operating on the bridge saddle is indicative of the immense size of the bridge. Each saddle consists of three segments bolted together and weighs approximately 150 tons. The inner grooved surfaces provide smooth supports for the cable. Since the sag in the cables is lessened as the work progresses, it was necessary to place the saddle on rollers a few feet from its intended position. The shifting shoreward continued until the saddle reached the desired position and then "killed." The plain carbon steel used in pouring was taken from the two open hearth furnaces by large ladles which poured it into the pit molds. After removing the risers, the segments were annealed to remove internal stresses. The roughly machined castings were then shipped to another company for the final finishing operation.



—Courtesy Scientific American

Cable Saddle on Golden Gate Bridge

St. Pat's Ball Is Great Success

Ed Post Crowned St. Pat

"Perfect," "Best dance on the campus this year" and "Couldn't be better" are just a few of the comments, all favorable, that came from some of the 350 couples that attended the St. Pat's Ball on March 27. Though the attendance was lower this year than it was last, the dance was a great success. For the first time in three years, old man weather smiled on his children from north of Green Street and produced flawless weather conditions for the dance which was held in the Gym Annex.

The Engineering Council was praised highly for its selection of Emil Flindt and his orchestra to supply the music. Flindt, a veteran in the entertainment world, seemed to know just exactly what to play at the most appropriate time, presenting a perfectly balanced repertoire of rhythm from dreamy waltzes to the hottest of swing numbers. His waltzes were very suggestive of Wayne King.

The highlight of the evening was the crowning of Ed Post, senior E. E., at St. Pat the third. He was elected by the dancers as the most popular engineer in the College of Engineering. The crowning was done in unbeatable fashion by Prof. J. S. Crandell in his inimitable specially adopted Irish brogue. Post won over Winnie Black, C. E., Fritz Heinig, M. E., Bill Wheeler, Chem. E., Stan Sheldon, Cer.E., and Gene Robertson, Min.E. When asked to say a few words to the crowd after the coronation, Post, Treasurer of the E. E. Show, retorted with, "Don't forget the E. E. Show on April 16, 17, and 18."

Several of the faculty attended the dance, among whom were the patrons and patronesses, President and Mrs. A. C. Willard, Dean and Mrs. M. L. Enger, and Associate Dean and Mrs. H. H. Jordan. A committee dinner held before the dance was attended by Dean and Mrs. M. L. Enger, Associate Dean and Mrs. H. H. Jordan, Professor and Mrs. J. S. Crandell, and Professor J. J. Doland. Mrs. Doland was unable to attend because of illness. Professors Crandell and Doland are faculty advisors of the Engineering Council, sponsors of the dance.

The committee consisted of Rex Newcomb, general chairman; Tom Scholes, tickets; George Austin and Rog Benedict, programs and printing; Al Bitter, decorations; Curt Talbot, orchestra; John Langwill, arrangements; and Dave Harris and Bill Hendricksen, publicity.

ED POST
Most Popular Engineer

Terzaghi Lectures Here

Mr. Karl von Terzaghi, noted professor of Vienna's Technische Hochschule and the world's foremost authority on soils mechanics, presented a series of three lectures on soils mechanics here to eager audiences of faculty men, practicing engineers, and students, on March 30, 31, and April 1. Mr. Terzaghi came here from Harvard University where he is a visiting professor this semester.

"Theory and Practice in Soils Mechanics" was discussed by Mr. Terzaghi in his first lecture. He told of many of his interesting experiences and observations in construction work throughout the world. He emphasized strongly the close co-operation necessary between theory and practice.

In his second lecture, Mr. Terzaghi discussed Mohr's diagram, and the stress conditions for the failure of saturated, porous materials. The third talk was devoted to "arching" in soils, a neglected aspect of earth pressure phenomena.

Technograph Staff

As we put out the last issue of the year, we wish to thank the many staff members who worked so hard and cooperated so well with us in putting out the 1935-1936 Technograph. We want to especially thank Gordon Jeppesen for his splendid editorials and special articles, Gene Schubert for the same type of work, Harold Goecke for Who's Who, Jim Stein for College News and feature articles, Bob Zaborowski for National News and cuts, Carl Milner for special articles, Bill Hoban for College News, Bob Cline for feature articles, Rex Newcomb and John Sherman for Campus Snaps, Ray Furl for Faculty write-ups, Harry Nagle and Jim Skorez for Tecknoknaks, Wally Depp for special articles, Ed Hong for Mr. Chu and many pictures, Herb Goltz and Irv Lewis, College News, Walt Renner and Dean Kingman, for their work on the business end.

We also wish to thank the many contributors without whose help the issues would have been very poor.

"I wish we'd get a few shipwrecked sailors washed ashore," mused the cannibal chief. "What I need is a good dose of salts."

* * *

Lindley says that he prefers blonds because of the lighter overhead.

* * *

Ringquist: "That hair tonic you sold me was no good. Look at the bumps on my head."

Druggist, looking at the label on the bottle: "Great Scott! I've made a terrible mistake. This is a bust developer."

TECKNOKRAKS

She: Can you direct me to the ladies' rest room?

Bellhop: It's just around the corner.

She: Young man, I'm looking for relief, not prosperity.

* * *

A girl who can read the handwriting on the wall usually picks up a lot of naughty words.

Pruitt: "Give me a sentence with the word 'discrepancy' in it."

Mauck: "Read discrepancy how you like it."

* * *

Kush: "Is this candy pure?"

Reeves: "As pure as the girl of your dreams."

Kush: "Give me a package of gum."

* * *

Rhet instructor: "John, take this sentence: 'I led a cow from the pasture.' What mood?"

Ivaska: "The cow, sir."

* * *

Webster says that taut means tight. There are plenty people who have been taut quite a bit in college.

* * *

Eastern professor: Now here is a house without a flaw in it.

Bill Kahl: "What do you walk on?"

* * *

Then there was the young engineer who was named opium because he came from a wild poppy.

* * *

Professor Espy: "You should have been here at two o'clock."

Boyd: "Why, what happened?"

* * *

The E. E. Show gives out the following whiskey test:

Connect 20,000 volts across a pint. If the current jumps it, the product is poor.

If the current causes a precipitation of lye, tin, arsenic, iron slag and alum, the whiskey is fair.

If the liquor chases the current back to the generator, you've got good whiskey.

* * *

We suppose that the reason for so much water around the statue of liberty is that her upraised hand wasn't noticed soon enough.

* * *

One by one the contestants dropped out of the annual spelling bee until only two remained, the town lawyer and the stableman.

Everyone waited breathlessly for a word that would decide the match. It came.

"How do you spell 'auspice'?"

The stableman lost.

* * *

She used to be a school teacher, but she has no class now.

* * *

Little Audrey and her mother went to Ethiopia last month. While they were there an Italian Bomb hit Audrey's mother on the head. But little Audrey just laughed and laughed 'cause she knew that Italian Balm was good for the skin.

* * *

Voice from passing auto: Engine trouble, Bud?

Voice from parked car: Nope.

First voice: Tire down?

Second voice: Didn't have to.

* * *

She was only an optician's daughter, but two glasses, and what a spectacle she made.

THE ILLINOIS

TECHNOGRAPH

MEMBER OF E. C. M. A.

Better . . because IT'S WELDED

The appearance, sturdiness and cleanliness of the modern aluminum tea kettle, illustrate why many good products are better if they are welded.

The word "welded" is packed with meaning. It means light-weight without sacrifice of strength. It means sturdiness and ruggedness that can never shake loose. It means invisible joints as strong as the base metal. It means smooth surfaces with no place for corrosion to start. In short it means all that one piece construction can mean plus complete design freedom from the limitations of most other methods of metal fabrication.

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THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

SEPTEMBER, 1936

Volume 51 Number 1

THE Technograph continues its policy of bringing before its readers articles of interest, news vital to the engineering student, and a well balanced selection of non-technical material. Read The Technograph, enjoy it, and let us hear your criticism for its improvement.

• The harnessing of the tide speaks of unharnessed powers. What is the practicability of tidal control? An interesting discussion of the Passamaquoddy project is offered by H. E. Goeke.

• Returning engineers and new students will be interested in the summer activities of the College of Engineering. Many students derived practical experience through interesting summer jobs, while many others enjoyed a vacation of summer school.

• Mr. Chu who has acquired national fame renews his acquaintanceship with Technograph readers in *The Return of Mr. Chu*, a message of homely philosophy.

• Although a final list of staff members has not been made, we give sincere thanks to the following men who made this Registration Day issue possible: H. E. Goeke, M. K. Carr, H. McSkimin, M. E. Harvey, E. Hong, T. Morrow, J. Robertson, D. McDonald, M. Rosen, R. C. A. Purl, F. Henderson, C. Milner, S. Berman, B. Larson, and those others who helped in the Registration Day sales. We welcome staff aspirants.

Contents

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THERE WERE GIANTS IN OLDEN TIMES AND THERE ARE TODAY

At man's command 100 tons of liquid pig iron is being poured into the open-hearth furnace.

THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume LI | SEPTEMBER, 1936 | Number 1

A Message from Dean Enger

THE College of Engineering welcomes new students and extends cordial greetings to students old and new. We hope that you will take full advantage of the unusual advantages here provided.

The engineering curricula are designed to require the major share of the student's time. However, time should be found for general reading, for University lectures and concerts, for departmental technical societies, and for extra-curricular activities, such as the Student Engineering Exhibition and The Technograph. Your development will depend upon your use of time.

Best wishes for a busy and fruitful year.

M. L. ENGER.

Dean M. L. Enger

Faculty Changes for the Coming Year

Dr. Harold M. Westergaard resigned from the faculty as Professor of Theoretical and Applied Mechanics effective September 1, 1936, to accept the Gordon McKay professorship of civil engineering at Harvard university. Professor Westergaard had been a member of the University of Illinois faculty since 1916.

He has been succeeded here by Dr. Clifford Proctor Kittredge as Assistant Professor of Theoretical and Applied Mechanics.

Dr. Kittredge graduated from Massachusetts Institute of Technology in 1929 and is Doktor der Technischen Wissenschaften of the Technische Hochschule, Muenchen, Germany, 1933. During 1930-32 he held the Freeman Travelling Fellowship for graduate study abroad in the field of hydraulics.

Two new positions have been created in the College of Engineering this year to provide for increased enrollments.

One of these is an instructorship in civil engineering which has been filled by the appointment of James G. Clark, class of '35. Since graduation Mr. Clark has been with the Bureau of Reclamation in Denver, Colo., except for the first semester of 1935-36 when he was an instructor in civil engineering at Oregon State college, Corvallis, Oregon.

The other instructorship is in the Department of General Engineering Drawing, to which Mr. Stanley Holt Pierce '32, has been appointed.

Mr. Pierce has been working with the Chicago Rapid Transit company since September, 1933.

Professor Frank W. Stubbs, Jr., of the department of civil engineering has resigned to become professor of civil engineering at Rhode Island State college, Kingston, R. I., and Mr. E. E. Ambrosius, associate in mechanical engineering, has resigned to become assistant professor of mechanical engineering at the University of Oklahoma, Norman, Oklahoma.

Engineers Attempt New Field in

The Passamaquoddy Tide Control Project

Feasibility of Plan Discussed

THE Passamaquoddy project is one which is not exactly new in the minds of engineers, but it has been made possible, as have many other engineering enterprises, by the Public Works Administration. This job has not received as much publicity as the other large power projects of the last few years, but it is possibly a little more interesting because it is so different from the work with which we are acquainted.

It is not the first tidal power project in the United States, or rather in the area of the present United States; for there was a small tidal plant constructed in Brooklyn, N. Y., in the year 1736—two hundred years ago! There have been other small plants in use, both in the United States and Europe, although no large capacity plants have been erected. Major investigations have been made for large tidal-power developments on the Breton coast of France and on the Severn river in England.

Location of Project

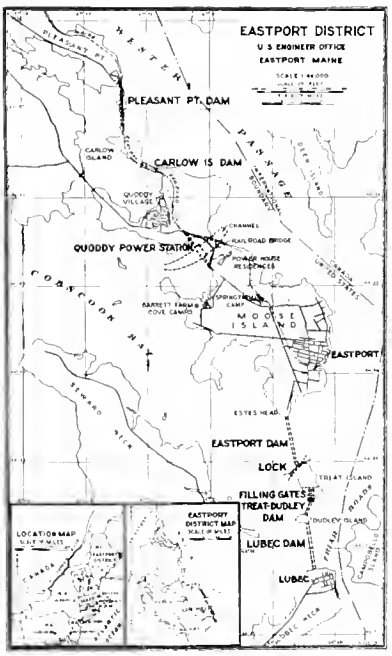
The Passamaquoddy project is located on the extreme eastern tip of the United States, in the Eastport district, in the state of Maine. Cobscook Bay is the position of the present extent of the work, although if the project becomes international in nature—as some who are interested, hope—Passamaquoddy Bay will also be included. The main portion of the Bay of Fundy, of which Cobscook and Passamaquoddy are branches, is directly east of Cobscook Bay. President Roosevelt's summer home is on Campobello Island which is opposite Eastport, on Moose Island.

The reason for the choice of this location for the plant is the large range of tides in the Bay of Fundy and its adjoining waters. The tides in the Bay of Fundy are the largest in the world. Cobscook Bay has 18.1 feet for its average range, while in one of the other arms of the Bay of Fundy, there is a maximum range of 50.5 feet. As the tidal waters rush through the more narrow channels, the great amount of available energy is easily conceived.

Perhaps a brief outline of the history of the development of the plans for this job, will help in making the discussion of the actual work less involved. The originator of the idea was Mr. Dexter Cooper, whose summer home is situated on Campobello Island where he has had ample opportunity to study the problem. In 1919 he put forward a plan, international in character, to harness this power by building dams and sluiceways in the openings in the Bay of Fundy, and powerhouses in the openings between Passamaquoddy and Cobscook Bays. Passamaquoddy Bay was to be used as a high level pool, filled at high tide, and Cobscook Bay to be emptied at low tide and maintained as a low level pool. Water, flowing through the powerhouses from the high pool to the lower at varying heads, was to be the source of power. The plan was certainly one to grip the imagination, but the cost estimates made by the most optimistic proponents, amounted to almost $100,000,000. However, no one knew just where all this power was to be marketed and the international aspect greatly complicated matters.

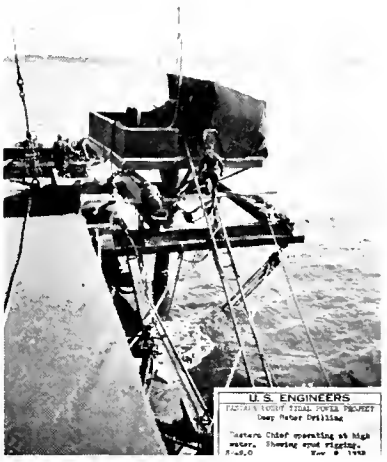
Charters Granted

Despite many obstacles, Mr. Cooper secured a charter from the state of Maine in 1925, to construct and operate such a plant, and in 1926 he obtained a similar permit from the Dominion of Canada. Interested concerns than donated $400,000 to investigate the possibilities of a tidal power plant. With these funds Mr. Cooper maintained a staff at Eastport to collect data upon which he could base his plans and estimates. In 1929, due to opposition to the international plan, he developed a second scheme which



placed the whole project within the boundaries of the state of Maine. It involved only Cobscook Bay and a pumped reservoir.

In 1931 Mr. Cooper tried to obtain a loan from the Public Works Administration for the construction of his second scheme, but was refused. In the meantime a board, appointed by the governor of Maine, recommended the work as a Federal project in the interests of work relief. Accordingly a commission appointed by Harold L. Ickes, Public Works Administrator, reviewed and reported favorably on the project. An allotment of $10,000,000 was then made from the Emergency Relief Appropriation of 1935, but this was cut to $5,000,000 when it developed that work on the construction could not be started at once. However, since that sum was largely spent or obligated by the end of 1935, $2,000,000 of the original allotment was reallocated to the work.



When the PWA took over the work of the Passamaquoddy project, they immediately turned it over to the army engineering corps for the supervision and technical work necessary. Lt. Col. Philip B. Fleming was assigned as district engineer to Eastport. On arriving at the site of the work, the engineers found the plans and specifications were only general, and that much work had to be done to get the necessary information to complete the design of the various structures. In addition, facilities for living and working were very poor, so one of the first things done was to build a small city for housing the help and providing offices and drafting rooms for the staff. This town, called Quoddy Village, was built in two units—the first to care for the emergency needs, and the second to provide for expansion and more comforts for the men.

Final Plans Agreed Upon

With the plan which was finally adopted by the engineers in charge, Cobscook Bay will be used as a high level pool filled at high tide and emptied through the power plant while there is a difference in head, between the pool and the outside water level, of 5½ feet or more. This will give about 57 per cent operating time for the plant. Originally a pumped reservoir at Haycock Harbor, to form a carry-over for this slack period, was planned, but due to the perviousness of the soil, this site was abandoned to keep the water supply pure. However, other sites are being investigated. Possibly the whole idea of the reservoir will be abandoned and a steam or deisel sta-

(Continued on Page 21)

Research an Invaluable Aid

The Thermal Conductivity Hot Plate

Accurate Results Provide Many Practical Applications

THE apparatus shown in the accompanying illustration is used by Pittsburgh Testing Laboratory for determining the thermal conductivity of such materials as cork, fibre boards, plywood, wood, glass wool, porous concrete, rock-wool, porous rubber and hairfelt.

Briefly, the apparatus consists of a thin flat electric hot plate between two identical specimens of the material to be tested. This combination is sandwiched between two plates, cooled by circulating water, alcohol or other liquid. Provision is made for maintaining constant the current through the hot plate winding, and, therefore, its temperature, and the temperature of the cooling plates.

Principle Explained

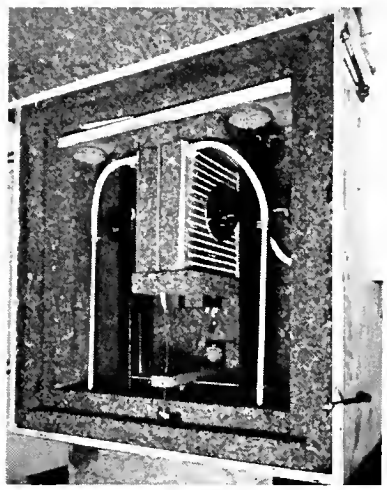
The principle of the apparatus is simple. Heat flows only where there is a difference in temperature. Therefore, heat flows from the hot plate through each specimen to its cold plate; and, since the specimens are identical, it is assumed that half the heat flows through each. The heat supplied to the central area of the hot plate, which equals the amount of heat flowing through the central areas of the specimens, is determined by measuring the electrical energy consumed by the hot plate. Results of the hot plate tests are expressed in British thermal units per hour, per square foot, per inch of thickness, per degree Fahrenheit temperature difference between the two sides of the material.

The construction of the apparatus is not so simple as its principle. The heater is made of nichrome ribbon wound diagonally on thin fiber board. On each side of this is placed an insulating sheet of mica. Outside this on each side is a copper plate. The hot plate is exactly the same on both sides, so that heat flow will be the same each way.

Each copper plate consists of two parts, a central area six inches square and a rectangular guard ring outside this, the whole plate being 12 inches square. The two are separated by an air gap of three thirty-seconds of an inch. Provision is made in the construction of the plate for maintaining the guard ring at the same temperature as that of the central area, so that there will be no heat flow laterally in the central area of the test specimens. It is in this central area that all measurements are made. The electrical heating element also consists of a central area and a guard ring, the central heater being eleven inches square, with the guard ring in the outer half-inch.

The cold plates are identical. Each consists of a copper plate twelve inches square, on the back of which is soldered a ribbing of rectangular copper tubing, to conduct the cooling liquid in this case, alcohol. The alcohol flows from an overhead tank into the bottom of each plate and out at its top to a small collection chamber. It is then pumped back to the overhead tank which is cooled by a small refrigerator compressor. The compressor is adjusted to produce a temperature slightly below that required in the cooling plates—say zero Fahrenheit. An electric heater and thermostat maintain the exact desired temperature.

All this apparatus is thermally insulated by being placed in a box lined with six inches of cork. In addition to this, each cold plate is encased in cork, except on the side in contact with the test specimen.



Courtesy Pittsburgh Testing Laboratory

Interior of Testing Apparatus

Eight different temperature readings are made at frequent intervals during a thermal conductivity determination as follows: The temperature at the center of each face of each specimen, the difference in temperature between the faces of each specimen and the difference in temperature between the central area of each face of the hot plate and its guard ring. The latter temperatures are zero when equilibrium conditions have been attained. They are used in adjusting the electric current flowing through the central heater and the guard ring heater.

All temperatures are measured with copper-constantan thermocouples. A thermocouple consists of two insulated wires of different metals, or alloys, welded together at a junction, which, when heated, produces a feeble electromotive force proportional to its temperature. In this apparatus, these electromotive forces are measured with a precision, potentiometer to .001 of a millivolt. Temperatures at the faces of specimens can be measured to .05 degree F. The thermocouple arrangement for determining the temperature difference between the central heating area and the guard ring is especially sensitive for sixteen thermocouples, eight on the central plate and eight on the guard ring, are connected in one series making possible the detection of a temperature difference of .006 of a degree F.

Test Requires Careful Control

Operating the apparatus is no more simple than its construction. The test specimens, which measure twelve inches square and may be of any thickness less than three inches, are first dried to constant weight. Then the hot and cold plates are thoroughly dried and the samples inserted. The cold plates are held firmly against the samples by springs, to eliminate any air gap and to provide uniform and good contact. Then the current is turned on and flows continuously during the test with such adjustments as are necessary to bring about steady heat flow through the specimens, and allowing no temperature difference between the central heating area and the guard ring.

Thermal conductivity determinations are usually made at about the same mean temperatures that would exist for a heat insulating material in actual use. Mean temperature is the average temperature between the warm and the cooler side of the insulation.

After steady heat flow has been established, temperature and hot plate current measurements are read at intervals over a definite length of time. Current readings are made with a shunt and a millivoltmeter. All this is quite a lengthy process. To attain steady heat flow conditions requires from twelve to sixteen hours, and current and temperature readings must be taken for a period of about eight hours.

The ultimate object sought in using the foregoing described apparatus, namely, the coefficient of thermal conductivity of the material tested, is calculated from the data obtained as follows:

The square of the amperage of the current supplied to the central heater is multiplied by the electrical resistance in ohms of that portion of the heater circuit behind the 6 inch square central area. This product is then multiplied by 3.412 to convert it into British thermal units, B. t. u.'s. Then with the equation or formula for heat flow—

$$Q = k.I\,(t_1 - t_2)\,h\ .d$$

the coefficient of thermal conductivity is computed, where

- Q = half the B.t.u.'s.
- A = area of the central area
- t_1 = temperature of the hot plate.
- t_2 = temperature of the cold plate.
- h = time in hours.
- d = the distance between the plates, taken as the thickness of the specimens.
- k = coefficient of thermal conductivity of the material being tested.

Thermal conductivity is used as a measure of the heat insulating value of a material, the lower its conductivity, the better it is as an insulator.—M.K.C.

Have You Asked the Question:

WHAT IS THERE IN RADIO?

A Well Balanced Criticism Offers an Answer

IN THE bonanza days of radio, there would have been little need for an answer to the title question; but now, however, the industry has become stablized to a great extent, and it is no longer possible to extract the best of nuggets without a great deal of effort and education.

Servicing

Probably the first branch that should be considered is that of servicing, for a minimum of capital and past experience is necessary to set up a business. As long as there are radios, there will be a need for expert service men, yet the prospects should not be thought of as too rosy. In the first place, there are more men interested in maintenance work at the present day than are actually needed. Even so there are still a few almost virgin territories open to the enterprising man.

At the present time the radio set industry is at a peak. Staggering out of the depression's wake, it has surpassed even the year of 1929 in output of receivers for use in the home. It is doubtful whether this height can be maintained; there are logical arguments indicating a decline within the next few years. It is evident that perfection, **per se**, can not be surpassed; furthermore, the approach to perfection is assymtotic in nature. Already the industry is well out on the curve; the more expensive sets on the market are almost perfect as far as accoustic reproduction is concerned. A degree of sensitivity and selectivity often appreciated only in the laboratory has been made possible by use of newly developed tubes and crystal filter circuits. In fact, methods of attenuating the action of the latter for suitable broadcast receiver use have been sought. Even the "bugbear" of radio, static, is being successfully combated by the use of high power transmitting stations, suppressor circuits, and short wave lengths. Is it not logical to suppose, then, that good receivers purchased today will still be in modern use eight or ten years hence? Once the obsolete battery sets are replaced, along with the first all-electric sets, the sale of radios for the home is very likely to taper off.

All of this reasoning indicates that the servicing end of radio will not be an expanding one. Nevertheless, as has been pointed out, there are still good opportunities, and good money can be made, especially if side lines, such as public address work, are followed.

Radio Operators

There has always been a sort of psychological glamor surrounding the radio operator, especially the marine operator aboard ship. Glowing are the pictures of "Sparks," a swanky young man walking the decks with a beautiful maiden on either arm, seeing the world in luxury and comfort. Too often, the true picture is distorted by schools advertising and playing up the ranking as an officer, and the long shore leaves. As it often happens, the poor operator must help with the loading, or make himself otherwise useful when his other specific duties do not demand him. Furthermore, he is often refused the association of passengers on the ship and is sometimes compelled to stay on ship instead of being granted the much desired shore leave.

As for new positions—they are scarce. When even the first class liners, such as the Queen Marie, employ only a handful of radio men (ordinarily no more than three), it can be seen that there is little chance of being placed for the completion of a liner is not an everyday occurrence. Though not quite as appealing, the position as operator aboard some freighter ordinarily will pay as well as or better than that of chief-operator on some large trans-Atlantic passenger ship.

If it is not required by law, the steamship lines usually require their operators to hold first class licenses. To make matters worse, it is impossible to obtain a first class license (commercial radio operator) without having had at least eighteen months' of previous experience on board ship or some costal or land station. Hence, there is a vicious circle than can hardly be broken into.

To complete the rather pessimistic outlook for the ship operator, it should be borne in mind that the pay is never handsome, one hundred and fifty dollars a month being near the peak. Furthermore, there is no possibility of advancement. If one would seek an opportunity for this, he must leave the rank of ship operator.

Opportunities are Varied

More encouraging is the picture of the coastal station operator or the point-to-point operator. Though difficult to obtain a position, there are possibilities for advancement, especially if the operator holds an engineering degree. The pay is much better and the work more varied. Here as before, only men of experience are wanted.

A word must be said of radio as applied to the aeronautical field. Most airway companies train existing pilots to handle the radiophone equipment on the planes. There is only one organization which employs code operators and that organization is Pan American Airways. The only reason for this is that the long distances travelled from the bases make phone work impractical and at times impossible. Of course a few men are employed at the ground stations, but even so, the field can not be considered open.

Let us turn our attention now to the broadcasting field. Here it is possible to make a fair wage as a skilled operator with a large company. It can be said that chain network organizations, such as NBC, pay well. On the other hand, the author knows of a case where the chief engineer of a good local station gets no more than forty dollars a month. With many stations it would seem that the wages are very poor.

It is not probable that the number of stations will increase. The trend, in fact, is in the opposite direction. In 1921 there were over a thousand broadcasting stations in the United States; today there are only some six hundred. With the advent of higher powered transmitters and chains, the utility of the small local station has dropped considerably. Then too, there are even now more stations operating than would be desired from a standpoint of interference.

Of the useful frequencies, only one small band of some forty kilocycles in width remains unused by the United States. International treaty has allocated the other frequencies for various other uses. In this small band only about ten modern stations could be operated successfully. Whether or not the ultra short waves will prove useful for commercial broadcasting remains yet to be seen.

Salaries are Modest

As for the announcer—that glib man who can enthusiastically recommend any product from soup-to-nuts and be entirely unabashed all the while—not too much can be said. A good announcer often gets paid well; as a rule, the wage of the usual small station man is nothing extraordinary.

The script writer should not be left out of the picture. Writing script is an art in itself and requires a person especially talented in that line. Though not connected directly with broadcasting, writers of radio magazines, both technical and non-technical, are employed.

Though by no means the only branch as yet unnamed, radio engineering holds a prominent place in the field. It is perhaps one of the most stable branches and hence is very favorable to the graduates of our universities. The engineer who has had four years, at least, of study is well prepared to meet the opportunities of various natures that present themselves. He has, by the time he has received his "sheepskin," acquired an insight into subjects which can be of use to him no matter what line of work he finally follows. Most colleges and universities offer radio courses for students in their third and fourth years. As it usually happens, the radio engineer is also an electrical engineer, for seldom is a degree in radio engineering given as such. The graduate is therefore prepared to fall into any of a number of types of work. Large companies such as General Electric and R. C. A. employ many men for research purposes alone. Other companies use engineers for design work. Thus, even though the time required and the money spent for education as an engineer are large, the chances of getting worthwhile positions in radio are good.

And so it goes. Not all of the branches of endeavor have been named; there are others, but certainly it is this very flexibility that makes the radio industry outstanding and interesting. It is hoped that the author has not painted too dark a picture in places; for, notwithstanding these, there are many bright spots to make the outlook pleasant. H. McS., W9DPD.

CARROUSEL . . . . .

Summer Job is Interesting but Tough

Circuses have long since been a fruitful source of material for "behind the scene" story writers. Carnivals, while lacking the host of entertainers and considerably smaller, provide just as engrossing subject matter in the experiences of the men who do the "setting-up" and "tearing-down."

•

THE boys having had the day before off were in excellent spirits, bandying words back and forth, as they finished loading the last few boxes on an already heavily loaded truck. It was early morning and still refreshingly cool. Al, a young lad and boss of the crew, was giving a helping hand.

"If you hurry, I think you'll make it before the sun gets too damn hot!"

Remembering his experience working in the intense heat, each man renewed his efforts. The sun had been intolerably hot for the past week and showed little sign of respite this morning. Secretly, in spite of their grumbling, the men were quite proud of the fact that they could "take it."

Chuck, the driver, a university graduate, had already started tieing the load. His laborious efforts were characteristic of his dogged slowness, yet he managed to be good-natured about the sarcastic jibes of the crew.

"Expect to get done today?" asked Al, good-naturedly, as he went over to give Chuck a hand.

With the final preparations for departure, there was always confusion. Someone lost his hammer, another could not find the apron he had so carefully put away, still another hunted for his lunch.

"All set?" Without waiting for an answer, Chuck swung the sputtering truck slowly out into the street.

"Don't forget to get back!" yelled Al as he banged shut the warehouse door.

After an hour of uneventful riding, the truck pulled into the lot where the men were to set-up the carnival. The merchandise was quickly unloaded and carried into the church hall where the driver was to check it in.

Pencil and checking-book in hand, Chuck lumbered away towards the hall. Cries of "See you tonight! . . . Don't get lost! . . . Need a few men to help? . . . " followed after Chuck. He turned, looked back quizzically, and then, shrugging his shoulders, disappeared into the doorway.

There was lumber enough for seven booths, a milk-bottle and balloon-dart game, a corn game, a refreshment stand, and a big-top. Each piece of lumber from the huge tent poles to the short ball-game braces has a definite place as it is unloaded; it is upon this knowledge, primarily, that a carnival man's worth depends. The equipment was built for rough usage and for ease in setting-up. All of the lumber is hinged, so that the only hammering necessary is to force the spikes into ill-fitting hinges. The big-top with its some thirty odd stakes is the most arduous job; everyone lends a hand in putting it up before any of the other work is started. The knack of setting-up depends upon one's endurance and not upon his intelligence.

With four men unloading, the carnival was soon spread about the lot in its intended position. The sledge hammers were brought out, and, in a few minutes, the first stake was happily disposed of. The ground was hard and the sun was becoming hotter. After about ten stakes had been driven in, the men were drenched with perspiration. It was dangerous working with slippery hands.

"Whoa!" cried Hurks, a young member of the crew. His sledge missed the stake and sent him sprawling almost directly under his partner's next blow. Luckily, the sledge did not finish its intended course.

"Hell! I'm tired. Let's get a drink!" exclaimed John, the outfit's carpenter. No further encouragement was needed. Everything was dropped as the men shuffled off in search of water. The prairie was ankle deep with dust, and the men presented a pitiful picture as they trudged along.

Chuck returned, to everyone's surprise, just as the men were resuming their work.

"Here, let me have your sledge. I'll pound for awhile," offered Chuck.

John needed no further coaxing.

A minute later there was a sound of splitting wood as the handle of Chuck's sledge crashed down upon the stake. And so, three men finished driving the stakes. The tough part of the job over with, the remainder, tieing the ropes, putting up the center tent poles, side poles, and drops, followed in rapid succession. At this time, another call for water was heard.

A huge crowd of children had assembled to watch the carnival grow. They were of all ages. Some quietly looking on, while others besieged the men with questions.

"When does it start?"

"When ya goin' to put up the ferris wheel?"

"Ain't there goin' to be no horses?"

"Hey, muster, kin I help you?"

Then there were comments they made to each other.

"Boy, look at the muscles on that guy!"

"You know, Johnny, my dad's goin' to gimme a quarter to spend. Maybe I'll win one of those wagons, huh?"

One little girl of about nine had just pulled her toddling sister from under John's foot. She gave Lucy a withering look and then smiled sweetly at John. With all of the grace she could summon, she said, "I think that little children should be at home. Don't you?" And without waiting for a reply, added, "I told mamma not to let her out."

Little Lucy looked up, snubed, and then said, "Nuts!"

•

It was Sunday morning. The crew had been working the entire night on an out-of-town tear-down. Tired and dirty they had started loading the truck for the huge day's work ahead. The boys would be given a chance to make a little extra money today by running the concessions for the Joyville Centennial.

Al, who had spent the night sleeping in the warehouse and still in his undershirt, was giving the last few orders.

"See that you got everything. Find out what time you have to make the pick-ups tonight, and remember, no stalling!"

The men were too tired for comments and sullenly got into their regular places on the truck. John was now driving. He had caught a bad cold, and his deep cough implied immediate attention. The two men on the back of the truck were sprawled on the canvas, asleep. Two others sat in the cab each sucking on the charred remnants of his two-for-a-nickle cigar.

This was Joyville's Centennial and the town's officials were even more official as they ordered their assistants about. After considerable controversy they agreed on the location for the set-up. Just as the crew finished, the man in charge arrived and decided to have everything moved!

A few minutes later they were all at the water hydrant washing off some of the dirt accumulated during the past thirty hours. Clean clothes had been taken along. By noon, Al had assigned the men to the various booths and everyone was ready to start the day's work.

Throughout the entire hot afternoon more and more people crowded the carnival. They spent freely as they jostled about aimlessly, stopping at any place that a barker was able to interest them. It was impossible to distinguish any one particular sound; the din was that great!

From one corner came Chuck's voice calling, "Here it is, Chuck-a-Luck, that old army game. Six numbers! . . . three winners! . . . you lay 'em and we pay 'em! . . . "

From across the field could be heard Al's loud-speaking system at the corn game.

"Bingo, Corno, Screeno, they're all the same. Every game there's a winnah here. Just a few more . . . " the rest was lost as the organ on the merry-go-round started its twentieth, tin-panny, repetition of "I'm Just a Vagabond Lover." About this time the dance orchestra decided to give the people some good music. A few runs by the pianist and they were off to a flying start on "The Tiger Rag."

(Continued on Page 22)

Material Selection is Important

Mechanical Engineering In Aviaition

Field Provides Promising Future

AS FUTURE engineers, in whatever branch of engineering you may be, you are going to be interested in the materials used in and the methods of fabricating a desired product, whether it may be an electrical motor, a bridge, an automobile, or an airplane. I have chosen to write about material selection methods of construction in the factories of the aviation industry as being illustrative of a field of the mechanical engineer. It should be quite clear though, that the same discussion modified only in detail would be applied to almost any industry.

The aviation industry even as recently as 1933, when the first of the high-speed transport ships were appearing in scheduled operation, had an annual income which from the dollar-volume standard would seem to indicate that aviation is still less important than the five-cent candy-bar industry. Whatever industrial importance air transportation may have, probably depends, not on its worth today, but on its possibilities for growth. This is indicated in the history of the industry which has continually shown growth year by year.

The ultimate product of the aeronautical factories is transportation. The present standards in transportation, from the standpoint of speed, have been made possible in part by the production of better power plants with every passing year. The original Wright engine weighed 21 pounds per horse power. Today commercial radial air-cooled engines developing as much at 1,160 horse power at 2,700 revolutions per minute weigh as little as 1.2 pounds per horse power and are much more reliable.

Alloys Have Widespread Use

The widespread use in modern engine construction of strong, tough, and dependable alloy steels has made possible the present low weight-to-power ratios. A conception of the amount of such steels used in a modern engine may be had by considering the following data. If an engine of the Wasp type were to be melted down and the various different materials separated, it would be found to have been composed of, by weight: 48 per cent alloy steels; 45 per cent aluminum alloys; 6 per cent magnesium, copper, brass, and bronze; along with 1 per cent of rubber, asbestos and other miscellaneous materials.

Mention of some actual applications of some alloy steels will serve to illustrate some of the considerations necessary in the choice of materials. The bolts used must not only be strong and tough but must be resistant to stresses such as are caused by vibration of the engine. A straight nickel steel having a composition containing $3\frac{1}{2}$ per cent nickel is commonly used for such engine bolts. Cam shafts demand a material which has good machining qualities along with high resistance to wear. The steel used for these shafts must have properties such that after machining the cam shafts can be heat-treated along with case-hardening without distorting the shafts. A steel having a composition including 5 per cent nickel with a small amount of carbon was found to suit the purpose. Steels used for crankshafts must exhibit higher elastic properties along with resistance to growth at the high temperatures existing in engines. Two alloying elements, nickel and chromium in small amounts, were used in the steel found satisfactory for such crankshafts.

Interesting Problems are Met

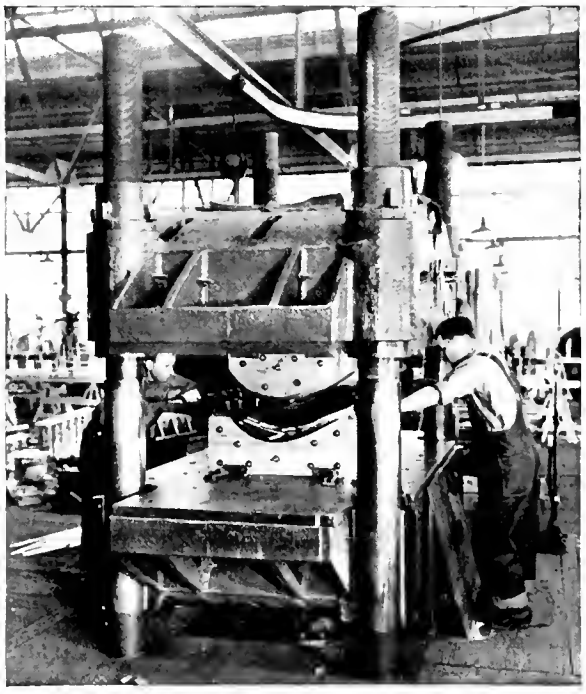
The choice of the steel, principally used for tubing in aircraft fuselage construction, illustrates very well a primary consideration in making the final determination of which material should be used for a given purpose. A steel having sufficient strength was obviously necessary, but the tubing had to finally be joined together in some manner to form a rigid structure. A chrome-molybdenum steel was found which could easily be welded and had the necessary final strength. Here, not the final use, but the method to be used in fabricating the desired structure determined the material to be used. It should easily be noted that this consideration is just as important in material selection in thousands of other industries. Whether you are building a skyscraper or a fine watch, the same question of how am I going to put it together arises and part of the answer lies in the material chosen.

There are, of course, many other alloys besides those of steel in common use. Each of these has some special characteristic which makes it valuable for some particular use. Two fairly common alloys belonging to this group are Monel metal and Allegheny metal. Monel metal, an alloy of 70 per cent nickel and 30 per cent copper is used in parts of engines and auxiliary drives subject to corrosive or erosive attack. Seaplane fittings are generally made of this material to resist the corrosive action of the salt water. Allegheny metal is a stainless steel alloy containing 18 per cent chromium and 8 per cent nickel. It not only exhibits corrosion resisting properties, but also non-magnetic characteristics. It is found in aircraft used for parts of the control equipment located near the compass because of these non-magnetic properties.

Welding Fundamental

The mention of welding brings an opportunity to mention another field of the mechanical engineer, machine design. The aviation industry sought some method of joining sheet metal without the use of rivets. Engineering was given a chance to do its job of finding a better way to get the desired

(Continued on Page 17)



— Courtesy Aero Digest

Hydraulic Press having 700 tons pressure, for heavy sheet aluminum parts.

THE RETURN OF MR. CHU

Offers Friendly Philosophy to All

CHOO-choo-ooooooooo! The wheels squeak while the train pulls in and stops at Champaign, the home of the University of Illinium. Alas! The Hon. Mr. Chu returns from vacation to be active with fellow classmates. The school buildings and special book sales at the co-ops give a most unpleasant welcome, but overshadowed by special soda sales at the favorite coke shops presently. There and around all University grounds, Chu sees new and old faces. Chu much absorbed as others by the actions of freshmen walking aimlessly and foolishly about. Finally, Chu observes sunburnt faces and familiar figures roaming hither and thither. Greetings signaled by Chu and vice versa. Much happy over friendship rejuvenation and Chu exchanges vacations vocally. It was very interesting and so enjoy scenery and mountain air very immense.

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Chu Ready for Big Year

Vacation proclaimed over by board of directors, Chu ready start big year. He hop on famous two-wheeled limousine and have big peace and concession talk with Prof. Chu, no play but talk business; tubing, you understand. Art is very difficult, maybe catch on fast and maybe slow; very unfortunate for Chu, no catch at all for last three years but perhaps better luck coming year. Prof. hinted art not very successful; suggest burn midnight oil and concentrate on text book, not story book or magazines. Chu think very noble idea but practice not what he believe. He make change for this year, study two-thirds of time and sleep rest of time. Prof. return compliment for alteration and say Chu might catch up and possibly have honor to make freshman honorary, Phi Eta Sigma!!!

Chu bowed and thank him for noble foresight and ask how Chu may make use of time for best advantage. Hon. Prof. not bored, but Chu find him quite unhappy in hot office, no ventilation, squeaky floor, and antique furnishing in upper floors of Engineering Hall. Wiping sweat off brow and cheeks, Prof. replied, "Very excellent question asked. More important, you have sought advice from competent sources. All students should give thought to this, especially freshmen."

Smiling and happy, Chu patted self on back and say to self, "Pull wit together, maybe magic charm of tubing catch finally." Jovially, Chu say, "Thank for compliment, please proceed on advice."

●

Prof. Offers Advice

Prof. turns on old revolving chair and taking puff from pipe continued, "Much is going on all the time. For instance every fall smokers are held so that students may get acquainted with the different societies and make new friends."

"Yes, very nice of the societies. Always furnish plenty of donuts and cider for the poor students at smokers and also broadens one's mind with interesting talks and speakers throughout year. Very good idea to join them, eh Prof.?" interrupted Chu.

While Chu removes coat and roll up sleeves to catch more air and ventilation, the Prof. commented, "These societies are doing wonderful work in trying to help students by their programs. Talks on current developments are very helpful in giving knowledge to students, as they can not acquire it from text."

Chu commented, "They understand activities give large benefit but hesitate pay membership fee and so excellent speakers could not be obtained. Kindly suggest way to overcome fear of gold-digging on students."

Very sympathizing, Prof. looked at ceiling and say, "Very unfortunate, indeed, perhaps they can be persuaded by suggestions from faculty wisdom."

"True, but not many advisers are active in student affairs," commented Chu, "most of them are non-committal; like the L. A. S. student, they loaf and sleep."

Prof. shocked! Snaps up in chair and sound off. "You got idea like nail hit hammer but must remember, he got much work to do and have no time!"

Chu replied, "That maybe thing wrong, Prof. concentrate and think too much of himself. Maybe wake up some day."

●

Technogripe Honorable Magazine

Reclining back on chair, Prof. answered, "Very astonishing statement indeed, perhaps story in honorable magazine, Technogripe, about faculty inactivities may bring inspiration."

"Hope they feel same," say Chu, "but what are other activities to make use of time?"

Prof. sighed and glad relief from topic of faculty comments, "Weather very beautiful, students should indulge in games and sports and build up resistance to infections and sickness. Reward maybe offered by Hospital association for good health. Save doctor and hospital expense."

Chu comments, "I catch; all work, no play, doesn't make Johnny. Very clever proverb, Prof.?"

"Clever indeed, but no work, all play doesn't make Johnny either," retorted the Prof. "All these students think about is romance and drama, but interest not in learning and labor. A sad story for the instructor who must meet up with them."

"Maybe University like matrimony factory," Chu compared. "Student find maybe wife or husband."

Prof. smiled and feeling happy, forgets heat and carries on, "Excellent comment, maybe very true, I found my wife same way. Younger generation not so bad after all, perhaps even more progressive than us old timers. They aren't as bashful and work probably much more efficient. Mm ... mmm now, wait a minute. I'm jumping at conclusions too quick. Now, that's bad. I guess I'm changing into one of these modern youth, quite intriguing, I should say, uh huh ..."

●

China Girl Makes Chu Homesick

Subject put Chu in remorse, think of China girl away. Chu get homesick and turn seriously to thoughts of going home but blood shot through head and ask self question, "Are you a man or mouse?" Very grave question and after delberating decides self as man, so again thought turn toward school. Chu bids Prof. farewell while he sits in office dreaming of his schoolday romance. Chu walks out into campus and, with brains in high gears, dreams of happiness and good time for coming school year by participation in activities. The final resolution is: "Don't be a bookworm or a gold-bricker, but be both."

—E. H.

Petroleum Option in Step with Oil Development

The recently established option in Petroleum Production Engineering being offered by the Mechanical Engineering Department is finding increasing interest among the student body. Concurrently, a new oil boom is about to develop in the southern part of the state, and which may subsequently place Illinois again near the top in oil production and new field development. During the past summer, no less than eight major oil companies have been employing seismograph crews in exploring the vast region west of the older Illinois fields, a region which, according to the Geological Survey, has good possibilities for hidden oil fields. As a result of their work about one and one-half million acres of land have been definitely leased for oil development purposes. Among these companies are Carter Oil Co., Shell Petroleum Corp., The Texas Co., Gulf Oil Corp., Pure Oil Co., and Standolind Oil and Gas Co. Active drilling of test wells may soon start.

Should a large producing field result, a number of graduating petroleum engineers may find employment in an active field close at hand. A number of engineering students are planning to register in the new courses, M. E. 35, and 36, the coming year. These courses were taught to a group of students during the past year and are being handled by R. F. Larson, associate, 105 Mechanical Engineering Laboratory.

The Diary of Elmer Q. Cornerstone

Offers Good Example

CHICAGO, Ill., Aug. 15, 1975.—(Special)—(The following remarks, taken from the diary of Elmer Q. Cornerstone, were written by Mr. Cornerstone while a student in the Department of Civil Engineering, College of Engineering, University of Illinois, during the years 1934 through 1938. Mr. Cornerstone was killed last Wednesday when he was crushed under a huge bucket of molten berryllium, during his annual inspection of the Chicago branch of the Great International Aluminum and Berryllium Works. These excerpts, which deal mainly with the activities of Mr. Cornerstone, show why he rose from the position of a common laborer in the shops of the corporation to the position of president of the I. A. & B. W.)

Sept. 18, 1934.—Ah at last my hunger for knowledge is to be appeased. I am now fully enrolled as a student in this great university! Personally I think one should be given a degree if he can successfully get through the work of registering in one day.

Oct. 3.—The work is piling up on me. If I did all that the instructors expect of me, I wouldn't have time to keep up on my bowling and ping-pong, let alone date all those beautiful Alpha Gam and Delta Gam pledges I met last night. (Editor's Note: Mr. Cornerstone's handwriting was blurred at this point. The correct interpretation is in doubt.)

Oct. 9.—Had a long talk with my C. E. D. instructor today; he said that my work wasn't nearly up to my ability, that if I want to be a good engineer, I must get down to work and get more out of my classes. He had certainly ought to know.

Oct. 11. Heard about Phi Eta Sigma, freshman scholastic honorary, for the first time. As I understand it, if one gets an average equivalent to half A's and half B's, or 1.5 or over, he will be eligible for initiation into the society. One fellow was telling me that Phi Eta Sigma didn't mean much, that he wouldn't ever join it. Very true, he wouldn't ever join it, I happen to know that he is getting by on a three point.

Nov. 13.—Midsemester grades came out today. I'm not doing as well as I anticipated. I think my average is a little over 3.7. I would like awfully to get a 4.5 at the end of the semester. It would mean a lot to my folks. Maybe if I dropped my ping-pong and bowling, and only dated on week-ends, I can do it. Is it worth trying?

Dec. 22. I am leaving for home tomorrow noon for vacation. I think I had better take my trig and algebra books home with me. I have a fair chance to get A's in those courses if I work hard enough.

Feb. 2, 1935. Well, I made it. Most of my instructors said that I just got by, with the grades I was given. Those first two months of slacking almost kept me out of Phi Eta Sigma. 4.71 isn't so bad.

Feb. 9.—Tried out for Pershing Rifles, crack military drill team. I get a big kick out of good drilling, so I hope I made it.

Feb. 11.—Was bid and pledged into Pershing Rifles. I can get my blue shoulder cord any time next week.

Feb. 16.—Phi Eta Sigma initiation took place last night in Bradley hall. It makes me want to rate Tau Beta Pi and some of the other honoraries I will be eligible to in a couple of years if I keep my scholastic average up to where it should be.

June 1.—Working hard didn't hurt me any last semester. 1.82 to be exact. D—m that rhetoric!

Sept. 19.—Finished my registration this morning. Resolved to work hard this year in an attempt to get the Chi Epsilon award to the sophomore C. E. having the highest scholastic average for the two years. Working hard hadn't ought to be especially difficult this year—most of the sorority girls I knew flunked out. I really didn't think they were that kind of girls either.

Sept. 24.—I heard today that Jim won the Phalanx award to the freshman doing the most outstanding work in Military in addition to having good grades. I haven't heard who got the Hazelton award, the University Gold Medal, or the other military awards.

Sept. 25.—It was recommended that I join my departmental society so I connected myself with the student branch of the American Society of Civil Engineers.

Oct. 4.—A. S. C. E. meeting this afternoon. Besides having cider and doughnuts and a good time, I heard a swell illustrated lecture on super-highways. If the rest of the meetings are as profitable as this one, I had ought to get something out of my A. S. C. E.

Nov. 19.—I went to the A. S. C. E. meeting again this afternoon and heard a dandy talk on modern trends in bridge building by a well-known authority on the subject. The more meetings I attend, the more I value my A. S. C. E. membership. The person who recommended that I join a departmental society certainly knew what he was talking about. One can certainly get a lot, both personally and professionally, from associating with others studying the same profession. It broadens one's knowledge and interest in his chosen field. Sometimes I wish I could get into A. S. M. E. and A. S. E. E. too.

Jan. 14, 1936.—Tau Nu Tau, Engineering military society, published the names of the ten sophomores to win the T. N. T. awards for being the best in military drill in the unit. I would have liked to win one of the awards.

May 19.—I was informed unofficially this evening that my grades are sufficiently high to win the Chi Epsilon award. That's something to write home about!

Sept. 17. Registration. I have some nice stiff courses this year. It looks as if I will go to about ten less dances; well, at least five less. A fellow can't study all the time. All work and no play may make Jack, but it isn't much fun.

Oct. 23.—Last night I was informed that I had been elected into Chi Epsilon. The upper ten per cent of the C. E.'s are eligible for initiation into this Civil Engineering Society. I was also told that Bill made Pi Tau Sigma, Mechanical Engineering Society, and that Johnny made Eta Kappa Nu, Electrical Engineering Society.

Nov. 21.—Had invitations into both Scabbard and Blade, and Phalanx, Military Fraternities. Can't decide whether to join either.

Dec. 4.—Bid into Tau Nu Tau, Engineering Military Fraternity. Pledged. Initiation in four weeks.

Jan. 15, 1937.—Had a date with a town girl last night. Got home about two-thirty. Had an hour exam this morning. Flunked it. I thought I had learned!

May 3.—I was told last night that I am eligible to take the examination for Tau Beta Pi, all-engineering honorary. Theoretically the upper 25 per cent of the members of the junior and senior classes in the College of Engineering are eligible, but usually an average of 4.5 is required of juniors and a little less for seniors.

May 11.—Twelve fellows passed the Tau Beta exam. Four of the twelve are from our house.

Sept. 18.—Well, this will be the last time I'll register at this institution. But it appears as if it will be a busy year to top off the other three. I surely hope I get off on the right foot and then keep in step with Tommy Shedd, Hardy Cross, Jimmy Doland, and Frankie Stubbs. Oh me!

Feb. 19, 1938—Sigma Xi, National Society for the Promotion of Scientific Research, published their list of eligibles this morning and to my surprise my name was among the others. I certainly would like to find the money to join the society.

April 29.—Bill made Phi Kappa Phi, fraternity honoring highest scholarship among seniors, and will be initiated next week. I don't know what average they demand, but I guess mine must have been too low.

May 1.—Well, about a month more to go. Made University honors and Bronze Tablet, and as a result was up on the stage at the Honors Day Program. If I can find some cash anywhere, I think I shall invest in a scholarship key.

May 24.—Representative of the Great International Bridge and Iron Works interviewed fifteen fellows today. I casually hung out my nine keys and got the job. Don't say that hardware doesn't mean anything. I am to start in one of the shops so I can learn the fundamentals of the industry.

June 10.—Graduated with honors. Things look bright with a degree and a job.

* * *

(Editor's Note: In the industrial shakedown of 1960, when steel began to be replaced by aluminum and berryllium, Mr. Cornerstone was one of the leaders to instigate a change from iron and steel to the newer industrial metals. Soon after this Mr. Cornerstone was made president of the corporation, which position he held until his untimely death last week.)

—T. M.

Employed Engineers Point Towards Better Times

A Summer's Snooze

Engineering Campus Active During Regular Vacation Period

IF ONE had planned a trip to visit all the engineering students during their summer vacation, it would have taken him over a large part of the country, and he would have found the students working at many interesting and instructive occupations. Here are a few typical examples:

One of the most interesting of the occupations was the position, held by **Louis Kristof** of laboratory assistant in the Hydraulic Research Laboratory of the U. S. Bureau of Reclamation. Louis was located in Montrose, Col., where he was helping to test a model of the Imperial Valley Dam and the All-American Canal Works, which was built with a scale ratio of 1:40.

In another part of the country **David Cole** was working for the Ford Motor Co., in Dearborn, Mich. He was highly pleased with his job, as it afforded him a great deal of valuable experience, and he hopes to be able to return there next summer.

A little nearer home was **LaVerne Ekholm,** employed as a research assistant to a dentist in Rockford. He was working on the developmtnt of dental appliances.

Ralph Batt remained in Urbana for summer school, taking a course in T. & A. M. He was also working under Mr. Phillips in the reconstruction of the University Radio Station WILL to its new frequeney. This includes the building of a new transmitter on the south farm, the erection of two directional antenna towers, and rebuilding the old transmitter.

At the International Harvester Co., Farmall Works, in Rock Island, **Carroll Dunn** was employed in the inspection department. Carroll's job was to inspect various tractor parts. He liked the work, and felt he gained a large amount of experience in industrial engineering.

Harry Grier found a summer job of pinch-hitting for vacationists in the Executive offices of the Pan-American Wallpaper and Paint Co., in Chicago. Not much engineering, but he says it was interesting work.

Down in Missouri **John Brouk** had a couple of jobs. First he was in the refrigeration department of Stewart-Warner Corp., in St. Louis. He then accepted a job with the A. P. Green Fire Brick Co., of Mexico, Mo., where he expected to gain some practical experience in his chosen field—Ceramics. John also did considerable swimming to keep in shape for the coming water-polo season at Illinois.

Lloyd Danielson got an early start in an up-and-coming branch of mechanical engineering, namely, air conditioning. His work consisted of making air-conditioning estimates, special sales work, drafting, and machinery installation for the Air Conditioning Co., of Russell, Kan.

John Teiber is another engineer who turned commercial and spent the summer helping out at office work for vacationists in Chicago.

EIGHTY-SEVEN engineering students enjoyed the novelty of a summer session. During the day heat records wavered; evenings brought the harassed students lectures, readings, concerts, or plays for relaxation. The attendance at the concerts given by the Summer Session band and orchestra bespoke the engineers' intent to make up for time lost during the rest of the year. A highlight of the music season was the concert given by the Illinois Symphony Orchestra. The engineers had further chance for "culture absorption" with a presentation of four Shakespearean dramas by the University Theater. A few more ambitious engineers upheld the honor of their college by exercising their versatility in the acting and producing of the plays. The Jitney and Coffer-Miller Players, and the Tattertown Marionettes, presenting "The Taming of the Shrew," provided an interesting comparison with the campus plays.

The strengthening influence of a technical mind permeated one of the regular Sunday evening summer Vesper Services when Professor H. F. Moore presented "An Engineer's View on Religion." For those seriously interested in "star gazing," the Observatory held open-house a few nights a week.

After a week of exhausting study, the Skating Rink with its mixer was a welcome retreat. Engineers spent many fruitful hours polishing the mahogany.

In spite of the terrific heat, there were always a few restless individauls who had to have their tennis and golf tourneys; those poor souls who could not "take it" found relief in the refreshing waters of the University pool. Croquet, soft ball, horseshoes, and archery helped as fillers-in.

Considerable construction went on during the summer, especially on North campus. Work on the new metallurgical laboratory progressed with such speed that the second story construction work was completed by the middle of July! Considerable remodelling was done on the room heating and testing plant. The mechanical engineering department installed a complete air conditioning unit. The University installed a new phone system and rejuvenated the Auditorium and the Woman's building.

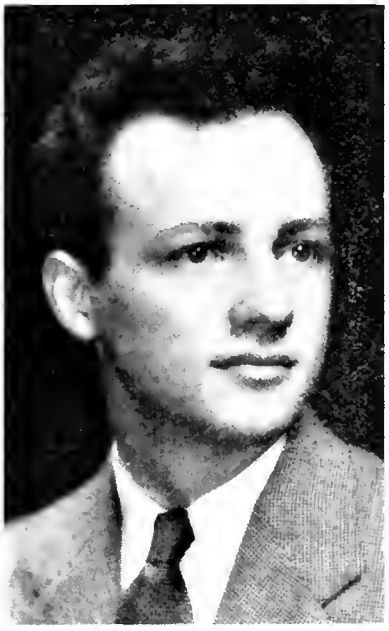
The actual studying incurred during the summer session presents the same problem that does the regular semester. Time is at a premium, and the student must study harder, theoretically at least. It is interesting to note that summer school students are more mature, as a group, than those vacationing, and they are really in earnest about getting their work. Perhaps the fact that they are mostly instructors, helps explain the situation. All in all, the Summer Session proved half as long, twice as hot, and twice as enjoyable as the regular semester.

Courtesy Engineering News Record

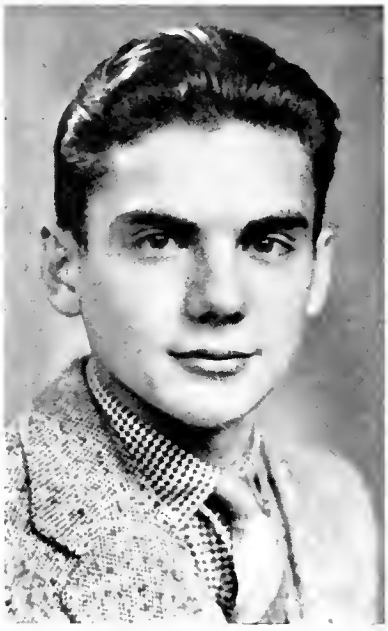
Grace and beauty are pronounced by the lines of the Lorain Road Viaduct in Cleveland.

• WHO'S WHO IN ILL

• Robert Hastings



• Norman Schoeppel



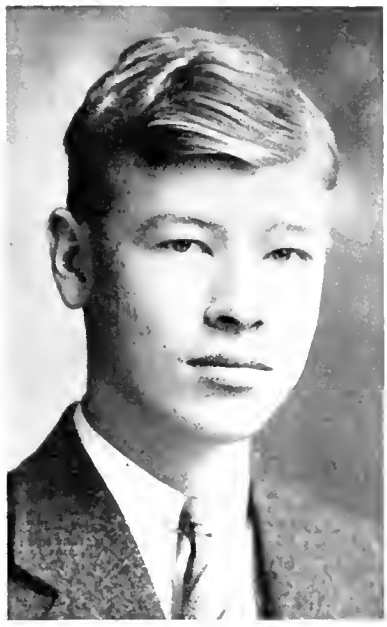
• R. C. A. Purl

ROBERT HASTINGS enrolled in Architectural Engineering at Illinois in 1933. Since that time his scholastic average has been high enough to make him an Honor's Day student and a member of Gargoyle, the architectural scholastic honorary. The law of averages must have been passed for him. Bob is vice-president (at last, a vice-president people hear about) of Alpha Rho Chi, and also vice-president (A connoisseur) of the A. S. C. E. Bob's hobbies are cabinet making (which is not so far from making blondes as it sounds), adding to his woodwork shop, and working catchy math problems (you see, he is good at figures). Traveling in the northern states is old stuff to Bob. His favorite spot, which he has hit for the last 10 years, is in northern Wisconsin. We can't say offhand what the attraction is, but 10 years ought to be proof enough.

NORMAN SCHOEPPEL'S fame on campus is so legendary you probably thought he was dead. This year Norm has made his best grades, and, at the same time, he has had the most dates. This was accomplished by a subtle blending of mind and emotions. As far as his scholastic record is concerned, he passed the proficiency exam in Rhetoric, and made College Honors twice (to prove that the first time was not an accident), and was the honor junior chosen the first semester for Tau Beta Pi. Norm is a member of Phi Eta Sigma, Keramos, and the student branch. Last year he was secretary-treasurer (two in one) of Keramos and will be president (do not envy him) of Keramos for the coming year, and president (he certainly can take it) of Tau Beta Pi for the first semester. He also finds time to devote to committee work at Wesley foundation. While at school Norm painted the town, but this summer he was kept busy painting his home (not red, I hope). Norm's hobby, most men of intellect have them, you know, is building home-made machinery like jig-saws and lathes, and using them just long enough to find out their faults.

R. C. A. PURL, who is not hooked up with Radio City, spent the first two years of his college career studying to the exclusion of most everything else. After this naive interlude Mr. Purl began his college capers. Was he a man or a mouse? He was not! In his junior year he joined a flock of honoraries and found that study and play go very well together. This past semester he hit all the big dances, made good grades with his heaviest schedule, and got plenty of sleep during finals (EDITOR'S NOTE:?????). Purl is vice-president of *Tau* Beta Pi and will represent them next fall at their annual convention in the East. Ray is treasurer of Theta *Tau* and Scimitar, the fencing honorary (probably collects dues at the point of a sword); he has a recorded membership in Phi Eta Sigma, Scabbard and Blade, and *Tau* Nu *Tau*. Ray received the Sigma *Tau* Award (just one more *Tau* and I'll scream) for the highest grades in the freshman engineering class. Ray spent the summer of 1935 with the Pullman Company, gaining valuable practical experience. Six weeks of this summer were passed at Camp Custer. At the age of nine Ray had traveled most extensively, having already visited 31 states! Since then he has done much repeating and has also included a few Canadian provinces. Before the voice of wisdom told him to come to Illinois, he had attended 12 schools in five widely separated states. His wanderlust can be attributed to the roving nature of his parents' stage career. At the tender age of three he (R. C. A. remember?) toured the country playing a speaking part in "East Lynne." Ray simply revels in attending such sporting events as the All-Star baseball game, the World Series, football games, and the In-

NGINEERING WORLD •



Harry Skinner •

George Logan •

Ted Hackett •

dianapolis races. He enjoys collecting theatre stubs and dance programs, and to whistle-like-hell all of the time!

TED HACKETT passed through the sweet innocence of high school days out at Wheaton, and graduated in June, 1930. Unemployment was not for him, so he got a job with the Western Electric Co. working on air conditioning units. Ted entered the mechanical engineering department at Illinois in the fall of 1933. He played freshman football, but found that he did not have time for the varsity (tough break for the varsity). After seeing some of his prospective opponents, he decided to tackle the books instead. Running track brought him his freshman numerals and then a varsity "I." Ted is treasurer of Triangle, and is a member of Pi Tau Sigma and Tau Nu Tau (look upon him with respect). In the spring of 1936, for some unknown reason, he became a member of the Tribe of Illini. Ted devotes most of his leisure to sports; he especially likes ice hockey. Music as played by Fats Waller, Cab Calloway, and Ted Lewis is tops with Ted. Also, Ted has an anti-hobby, he is a full-blooded *woman hater*. (EDITOR'S NOTE: This is an excellent stand to take during leap year). In the summer of 1932 Ted and three friends drove a 1916 Dodge to the west coast and took in the Olympic games at Los Angeles.

GEORGE LOGAN in his freshman year was elected to Phi Eta Sigma. There is the statement, make of it what you will. When he advanced into that state of coma politely referred to as the sophomore year, Mr. Logan (George, to his mother) joined up with Pershing Rifles to improve his tantalizing optics and to provide for himself a handy method of defense in case of—well, just in case. When George attained the lofty perch of a junior, he really went to town, in a manner of speaking. He signed up in the Advanced Corps, and joined Tau Nu Tau, the engineering military organization. By fate or design, he was made president (the fellow who gets all the credit) of A. S. M. E. for the first part of this year. George's hobby is model building, and it takes form in ships and coaches. George took to running (not away, and only for exercise) and "rasslin'" to build up the well known physique. He was born in Vancouver, but came to Chicago when five years old, which was good judgment for such a young kid. George spent the summer in doing general machine shop work for his pappy, preceded by six weeks at Camp Custer.

HARRY SKINNER who claims Aledo, Ill., as his home-town (whether the town claims him is a matter for conjecture) is president of Triangle. Although Harry never took the trouble to determine the stresses in his chain, it is rumored that the keys he has been wearing have caused considerable strain. After winning the Chi Epsilon Award for being the sophomore civil engineer with the highest average, Harry was pledged and then made president. Continuing in rapid strides, he soon made Tau Beta Pi (even more quickly, they made him treasurer). Since he does not make a habit of avoiding trouble, Harry joined the Advanced Corps and became a member of Tau Nu Tau. To counteract the effect of too many Greek-letter societies, he is busy proving the might of the pen as secretary of the student branch of the A. S. C. E. Baseball and wrestling would be Harry's hobbies had he the time to indulge. His usual summer as a farmer was interrupted this year by six weeks spent at Camp Custer exercising his commission as second lieutenant.

THE RIGHT ANGLE . . .

Personal Inventory

Have you students of engineering ever asked yourself the question, "Just what am I getting out of my college education?" Whether you have or haven't, in all probability you never did a very thorough job of answering yourself. This is a suggestion that you investigate the subject and arrive at an answer. The results may be gratifying; they may be disappointing; they cannot fail to be enlightening!

Visualize a problem; one from school-work, or one from everyday life. Do you attack it along these lines? "What are the given facts, the known conditions, the expected results? What methods are available? Which is the best method? This solution is the most direct."

With more complex problems, the procedure is often not so straight-forward, the outline is the same. Insofar as your mind functions along these lines, you have absorbed from your studies what your instructors were attempting to instill in you by requiring solution of problems and exercises that often seemed artificial, tedious, even exasperating. Unfortunately, many students make no attempt to understand why a particular instructor or course doesn't fit into their idea of how things should be. They merely dub the instructor too cranky, or the course too theoretical. They would do well to look beyond the actual material of the course and think of possible gain through the mental development alone before condemning it in its entirety.

Our college undeniably presents difficult curricula. Many find them too difficult. Nearly all experience exhausting periods of study; often they must forego pleasure, and sometimes they must lose sleep. When, however, this analytically inquiring attitude becomes a part of our mentalities, difficulties decrease to the vanishing point and our studies become a routine storing of points of interest. Not a small part of the improvement is due to the fact that, incidental to the true grasping of the fundamental idea, vastly increased powers of concentration are developed. The student finds himself able to accomplish his tasks in surprisingly short periods of time by the simple expedient of allowing no extraneous thoughts to enter his head.

All students are hampered by the lack of this attitude, because the work becomes harder as they advance. The freshman's work, so difficult for him, would be child's play for the junior, even if the upper-classman remembered none of the material of the freshman courses. The junior's own work requires his best efforts. Whatever his standing, as soon as a student thoroughly digests this idea, really the most sound basis of any exact knowledge, he will find his work readily surmountable. He will be amply repaid by spare time to be spent preferably in advantages other than book-learning that a great university such as ours offers. Some students reach this goal early; some never reach it. Probably most reach it as juniors or seniors. It is to be hoped that this presentation of the subject will hasten the attainment for many.

Whatever your walk of life in this scientific age of ours, this analytic method of attack will get results. The college presents the opportunity to acquire it. It is up to you to develop it in yourself. Have you? If you have, improve it! If you haven't, cultivate it!—R. C. A. P.

No Jobs?

During the past several years, college students—perhaps engineering students most of all—have been rather pessimistic and cynical regarding the value of their higher education and its financial meaning after graduation. True, during the first years of the depression not all graduates from professional schools secured remunerative positions immediately, but the present trend, in engineering at least, is to refute these ideas still held by many.

Correspondence with the heads of the departments in the College of Engineering reveals that practically all graduates are now employed. A survey conducted by the department of electrical engineering showed that 90 per cent of each class of the last two years was employed by October following its graduation. Further, in investigations of the salaries of one class, it was shown that the graduates monthly earnings progressed about as follows: first year—$125; second year—$150; third year—$175; fourth year—$190; fifth year—$225. These figures represent the average of the entire class, not merely the superior students. Indeed, according to Professor E. B. Paine, it has been difficult to find men with the qualifications necessary to fill positions brought to his attention during the last eight months. Professor Paine also says that his surveys point to 1932 as the real bottom of the depression, and that engineering salaries have been climbing since then.

Information from other departments is not quite so complete, but indicates the same general situation. The mechanical engineering department reports all its graduates employed at present. The starting salaries of the last class averaged slightly more than $119 a month. All graduates of the 1936 class from the civil engineering department had secured positions before the end of school. Their salaries run from $100 to $180 a month, and average about $125. Also, all of the classes of the last 10 years are 100 per cent employed, according to Professor W. C. Huntington. The railway engineering department brings a similar report, and while the other departments have no information compiled, it is believed that the same condition prevails throughout the college.

So there seems to be no foundation for the old gripe that study is worthless because there are no jobs. The thing to do is graduate with flying colors so that the head of your department can give you his highest recommendation. Then it is certain that there will be a place in the world for you, and another Illini engineer will be making his mark. The records show that our predecessors are running the engineering world from New England to the Golden Gate. Let's keep up the reputation of Illinois!—F. B. H.

Work and Play Pleasantly Combined

A City Slicker In An Army Camp

Six Weeks at Camp Custer—an Unforgettable Experience

IN an attempt to capture and convey in mere cold words the "human interest," side of the six weeks R. O. T. C. camp as endured by B Company in the arid, sandy wastes of Camp Custer, the following items are set forth.

For the first week, everyone fails in for all formations punctually and with anticipation. This state of affairs may be due to inexperience and, in any event, ceases to exist as soon as we learn the ropes; thereafter, most of us have to be extracted from bed forcibly and a number habitually fail to appear for reveille, with no apparent evil consequences. Roll-call becomes a farce and the platoon sergeants vie with each other to see who can finish calling his list of names first.

We all tire exceedingly of camp surroundings and seek diversion in Battle Creek, Kalamazoo, Gull Lake or Lake Goguac and its Rendezvous dance hall, with varying degrees of success. The Rover Boys on Gull Lake, Weldon, Eilertson, and Turner, capsize their canoe and receive a good soaking. Godfrey, Fay, Lamb, Whitehead, Evans, Siegel, and Olson bid fair to be known as the Harmony Tavern Hoods due to their frequent visits to that Battle Creek dive.

Weldon comes in late to mess, which is usually just too bad, but triumphs over circumstances, eats more than even Lipscomb and Snodgrass, and then pilfers an entire apple pie under his hat as he walks out.

And then there is moral-uplifter Ferguson—later to be known as the man with the finger. We confidently predict that this earnest young reformer will someday replace Evangeline Booth as head of the Salvation Army. Ask his companions in Tent 20.

Cadet-Colonel Neidhardt personally leads the Michigan State horse marines in a sand raid on the peaceful, inoffensive engineers.

Bill Renner and the irrepressible Weldon go on a prolonged week-end binge, forget their identities, forget to return to camp until Monday afternoon, and incur the righteous wrath of Sergeant Mount. For a couple of weeks thereafter they don't leave the company street, for some reason—probably remorse.

The third Saturday Lieutenant Dau names Tent 20, comprising Milner, Ferguson, Elden, Dewan, and Larson, the best tent in the company, but this claim is hotly contested by Logan, Slonneger, and associates.

Siegel talks a good type "A" fire trench, but is overshadowed by the steam-shovel-like activity of Fritz Heims and Gano. Siegel makes up for this inactivity, however, by carrying his horse back to camp when the engineers go riding.

Milner and Fritz chase three unlucky CCC boys out of the tree behind the Post Theater and view "Under Two Flags" gratis. (What a scene in the oasis!).

Most of us attend the annual R. O. T. C. dance in Battle Creek with dates obtained by Committee Godfrey and Gunn and, despite the torrid weather, manage to enjoy ourselves. John McConkey, P. F. C., nets a profit of $1.25 from an impromptu taxi service, but wakes up the next morning with a hangover and no $1.25.

We go on the range for a couple of weeks in the hottest weather of the summer, and, while everyone enjoys firing the Colt .45, the .30 Springfield rifle is more like work. Lindley, Turner, and Renner come out with bruised and bleeding countenances, but qualify nevertheless.

The chief bolos are Person of U. of M., and Mattiello of Michigan Tech., and receive the tin-can covers engraved by charge-of-quarters Siegel.

The Michigan fellows who will probably be remembered the longest are "Jag" Cosgrove, Cowboy Real, and Moon Mullen. Here's to you, fellows!

Sergeant Mount deserves something or other for his gallantry in picking up two nurses who were "walking home" and subsequently defying speed laws in getting them to the Sanitarium on time—according to his story.

Kush brings forth the disciplinary measures of Sergeant Mount by attempting to be first sergeant, K. P., and private of the guard all on the same day. He is confined to camp for the remainder of the camp period, but this fails to daunt our hero, who sets out for the Rendezvous the following evening. It turns out to be a **rendezvous,** all right, with the doughty Sergeant there to keep it! Was your face very red, Kush?

We depart on the long-awaited hike, and carrying 40 pound packs and our rifles we follow the infantry over a circuitous route for eleven miles to finally make camp at Eagle Lake. The engineers run away with the R. O. T. C. swimming meet and represented by Anderson, Fritz, Siegel, Gunn, and Kush of Illinois, Williams and Person of Michigan, and Sweder of M. C. M. T., dominate about every event. We learn during the afternoon's downpour that our shelter-halves are not very sheltering and eat our evening meal in the rain. Later the rain ceases and we build fires and dry out. Brother Stoner is tossed in a blanket by willing hands, but cannot equal the height attained by Dixon and "Uek" Bay. Many yarns are spun around the fires until we retire to our damp blankets only to be awakened at 3 a. m. We strike camp in inky darkness and follow our guides about four miles to the other side of camp, only to find that the infantry attack has been successful and that we may go back to breakfast. The same afternoon we turn in our packs and rifles and have our last inspection the next morning, which is Saturday. It is found that Weldon, as usual, needs a shave, and Dewan, a haircut.

On Monday we go out on demolitions, and, while at first there is some difficulty about generating enough voltage, we later succeed in shearing off a rail and dropping a pair of concrete posts with T. N. T. In extinguishing one of the ensuing grass fires, Fritz puts his nose in the path of Briner's elbow and R. C. A. Purl has the hair on his manly chest slightly singed.

In the afternoon we turn in all our famed G. I. equipment except our fatigues and beds and blankets, and then have the rest of the day off. On Tuesday we loaf, except the butt detail of Milner and Renner, who have to work in the pits in the morning. In the afternoon we turn in the remainder of our G. I. equipment and spend the time until Wednesday morning in various ways. Those unlucky enough to be in camp Tuesday night draw one blanket and a mattress and sleep between shivers and sneezes on the rather hard tent floors.

On Wednesday morning we draw our pay minus 35 cents paid to McConkey and Lieutenant Naylor for missing equipment, and then everyone sets out for anywhere that is not on the Military Reservation. That is, except W. R. Elden, who stays a couple of nights longer in Battle Creek. What was her name, Bob? Priscilla?

We leave camp with mingled memories of the good and bad aspects, but with experience and adventures we would not have gotten anywhere else, and we will view with more appreciation and enjoyment as the years roll by.—C. M. M.

Student officers getting practical military bridge building experience.

Mechanical Engineering in Aviation

(Continued from Page 8)

result; two sheets of metal permanently attached. Spot welding was the answer to the problem. A machine was designed and built and is now being used in some of the largest aircraft factories in this country. The advantage to the aviation industry of this new method of fabricating was quicker and more economical assembly, reduced weight, which always means better performance, and better aerodynamic efficiency due to reduced air resistance. This same machine is not only doing work for aviation, but it is also working in every other industry where sheet metal is used.

A finished structure, machine, or piece can be put together by such means as welding, riveting, bolting, or clamping, but the job before assembling is to get each part correctly shaped and prepared to be joined to other parts by some means or other. Here we are entering another field of the mechanical engineer, that of production. Production demands the use of tools. The tools necessary are dependent on the materials being used, and, once more, the effect of material selection on the tools being used is noticed.

Transition of Materials

In aeronautical history it is possible to trace the transition of materials as can be done with every other progressive industry. In 1922 stick and wire construction typical of World War planes was still in use by one of the largest manufacturers of planes in this country. By 1925 the bolted dural, an aluminum alloy, tube fuselage had been developed. Wood and fabric wings were still being used with the metal fuselages. The first successful smooth-skin all metal commercial transport appeared in 1931. The transition from all wood construction to that of all metal was complete.

What had happened in the shops during this time of transition? Wood working tools had had to be replaced by metal working tools. Riveting guns, metal drills, and portable welding outfits had appeared in the assembly departments. Such machine tools as lathes, shapers, milling machines, grinding machines, and drill presses had replaced band saws, rip saws, wood planers, and joiners. Equipment for handling sheet steel was installed in a new department. Punch presses, square shears, rotary shears, vertical spindle shapers, and a draw bench for forming any desired section of sheet metal were installed.

The factory manager of a company found that the use of forgings in place of built up parts offered many times an improvement in strength and durability. He also found that the cost of the forged pieces was in many cases higher than that of the built-up parts. In this situation the improvement in the part had to be balanced against the increased cost.

In this article I hope I have given examples enough to illustrate for you a few fields of the mechanical engineer and to show some of the considerations being made every day which effect, not only airplanes, but every manufactured article.—M. E. H.

FOLLOWING THE PROFESSION

Earthquake Proof Watertower

In the earthquake-stricken area of Southern California, the problem of adequate water-towers has sprung into the foreground. This interesting problem was recently solved in Pasadena, Cal., by the design and construction of a new type water-tower having a large capacity.

Overshadowing the architectural design in importance, was the problem of having the tower structurally stable. Allowing for stresses due to possible earthquakes, the laterial load was figured to be 20 per cent of the vertical live and dead load. The tank is 75 feet high and has a capacity of 150,000 gallons of water. The top and bottom of the tank were made symetrical in shape, being semi-parabolic in contour. False plates were used to accentuate the eight legs that were used to support the tank. It was found necessary, due to the exceptionally heavy interal loads, to use diagonal members instead of the usual rods and turnbuckles. Another unusual feautre of the structure was the use of ring girders on the inside of the tank at the junctions of the columns and the tank. During construction a special fin was welded to the bottom of the column shoe. It fitted into a specially made recess and was free to move during construction. When the tower was completed, the fin was fastened into place. This fin was used in addition to the large tower anchor and helps to efficiently transmit any lateral load that might occur.

To insure that the next severe hurricane will not tear down their homes, Floridans have built their homes of reinforced concrete tied in to the rock below by means of steel connecting rods.

—*Courtesy American City*

Tower designed to meet needs of earthquake-stricken region.

Forty Ton Ocean Clipper

Speaking before the Aero Club of Washington, D. C., Igor Sikorsky made the prediction that 40-ton clippers will be a reality within two years. He estimated that daily United States-to-Europe service can be established at a cost between $4,500,000 and $5,000,000. The large flying boat is the logical craft for ocean flying because of its greater speed, efficiency, and greater independence of operation in bad weather. This plane must have a non-stop range of 4,500 to 4,800 miles to provide at least 1,000 miles reserve for overcoming storm conditions, and speed enought to bridge the Atlantic in 21 hours. At least thirty passengers, and a crew of ten could be carried. Four to six engines would be used. All vital parts and power plants should be accessible from the inside of the ship for routine maintenance and repairs while in flight. The 40-ton ship will have passenger accommodations far better than those of the best railroad trains. Sikorsky is said to be well along with the designs and preliminary engineering data for a 40-ton clipper.

The Car of Tomorrow

What will the car of tomorrow be? Will it be the sleek auto of today, or will it be streamlined like a turtle? According to one of the country's leading design experts, the car of tomorrow will be the shape of a tear-drop, completely air-conditioned, and have self-inflated tires. Let us look about ten years into the future.

It is now the summer of 1946, and we are driving along one of the super-highways of tomorrow. Not a billboard in sight, no cross-roads to worry about. The design comfortably accommodates three passengers in the front and two in the rear. The luggage is out of sight in the bulbous front of the car. Equipped with six wheels, placed so that there are two in the front and four for power in the rear, there is no possibility of flats with the new self-inflating tires that always remain filled with air. Another feature is the self-filling battery.

The most interesting improvement is the development of two fuel tanks. One contains a highly volatile fluid that is used to start the car in cold weather, while the other contains ordinary fuel for the course of the day's run. When the weather is very cold, the car automatically changes from the ordinary to the high-test fuel. High-test fuel is used when the car starts, but is cut off directly sufficient heat of combustion is produced. Air conditioning eliminates the need of a water-cooling system for the motor or brakes. The dashboard of the modern car will not be cluttered with instruments as might be expected. Two instruments decorate the dashboard, the speedometer and the gas gauge. The oil pressure, the motor temperature, and the amperage will be indicated by red and green lights; the green light shining when everything is all right and red when there is danger.

Like a few of the 1936 cars, the gear shift will be on the dashboard. This is the car of tomorrow. What it will look like, no one really knows, but for the sake of a few of us, may it have a rumble-seat!

Helium Suggested As New Preventative of the "Bends"

Helium, now used to lift men into the air, is suggested for use in the battle against the "bends."

The "bends," a painful malady, is contracted by men who go under ground or sea as a result of being exposed to air at high pressure. It is caused by the blood absorbing much nitrogen from the air. When the man comes into normal air pressure, bubbles form in his veins and may result in permanent crippling or death. Even most modern methods do not obviate the danger of caisson disease.

Helium's solubility in the blood is reported by Drs. J. A. Hawkins and C. W. Shillings of the Experimental Diving Unit at the U. S. Navy Yard.

Helium is like nitrogen because they are both inactive gases and play no part in the actual requirements of the body. The former, however, is less soluble in water. Under pressure, therefore, less would dissolve in the blood and what did would be dissipated quickly if helium were substituted for nitrogen in the compressed air supplied to divers.

The use of helium was fully tested, and experiments and results show that it is just as soluble in blood as in water. Its use in preventing "bends" is possible.

Artificial Excels Natural

For the first time in history, a synthetic rubber has invaded a natural rubber-producing country to perform a function which the natural product cannot perform. The shipment of Du Pr'ene, a synthetic rubber, to New Guinea in the South Seas is an actual necessity. This product is used as an outer jacket for about 700 feet of heavy cable used in the gold-mining operations. It is also interesting to note that the gold is being mined in the jungles so far from civilization that there are no roads and no surface transportation facilities available; hence, the machinery had to be transported by airplane, and the refined gold is brought out in the same manner.

Road Testing Maehine

In Harmondsworth, England, they have a unique road-testing machine. At the Road Research Laboratory there, a large twelve-ton truck is held on a circular track 110 feet in diameter by means of a steel box-girder extending from a central concrete post. The truck is driven by means of an electric motor with the power supplied by a cab mounted on the mooring arm.

A constant speed of forty miles per hour is controlled from the laboratory by the men conducting the experiment.

Recent tests performed at the laboratory have proven that by running the truck steadily for several days the road is worn as much as it might were it used for several years.

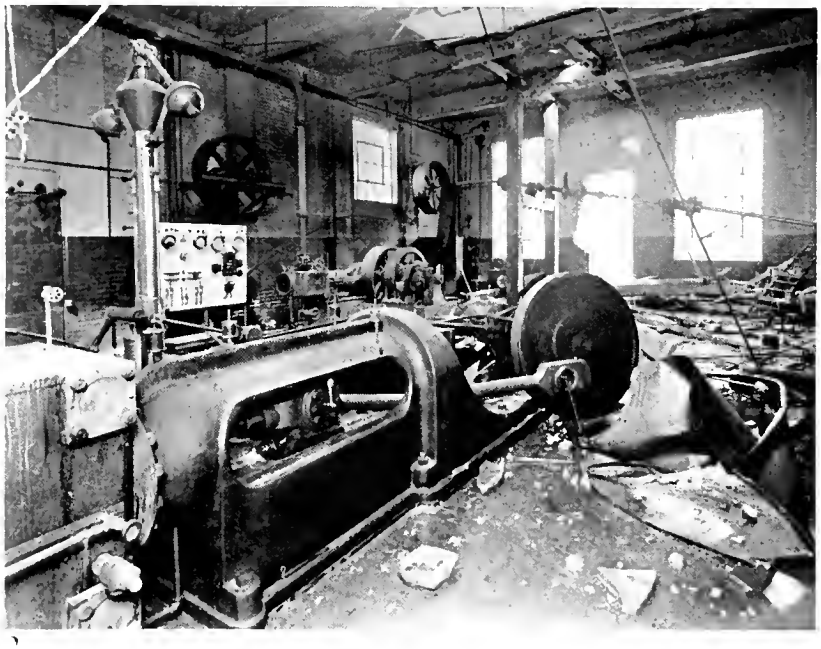
Flywheel Explosion

There was trouble ahead, no doubt. Perhaps it was merely a premonition, but when processing machines in a Southern textile mill several months ago began to suddenly speed up, operators thought it best to shut them down.

The reason became obvious a few seconds later when the fourteen foot flywheel on a Corliss type steam engine exploded because of the over-speed.

The damages amounted to some $12,000 since parts of the large wheel scattered everywhere. A piece about seventy pounds in weight was found 1,600 feet away from the engine. The engine was wrecked; the shafting, belting, sprinkle pipes, walls, roofs, and everything else within its region tasted the explosion.

It was an unusual accident since the fundamental cause was not apparent. The most likely and possible explanation was attributed to the failure of the governor belt.



Courtesy Hartford Locomotive

Scene in southern textile mill after flywheel explosion.

New Type Watercraft Has Aerodynamic Features

Incorporating both aerodynamic and hydrodynamic features for the first time on a watercraft, V. W. Strode, a Portland, Oregon, inventor, seems to have accomplished a unique feat. He has built a craft that is both non-sinkable and non-capsizable, a unique feature of any kind of boat.

The boat is radical in design since it is not only fully streamlined but has many airplane features. The hull is similar in construction to the wing of an airplane. It also has extending from its sides a wing-like structure of air-tight compartments. "Lift" is given to the boat by these wings when it operates. A stock light car engine is used and the boat is said to have a hull efficiency more than one-third greater than any motor of pervious design.

The speed of this new craft is tops at 40 miles an hour but additional development will extend it. It has perfect riding ease on account of its aerodynamic features.

At present the city of Portland has taken over the boat for ambulance and first aid service on the Willamette river.

Double-Decker Craft to Cruise Long Distances

The European military airplane race has given added interest to the new Mayo composite aircraft being studied by the British Air Ministry. It is the purpose of this plan to make available direct trans-Atlantic crossings and long-range bombing raids.

A giant flying-boat like those in the Caribbean Service would take off with a 4-motored, pontoon fitted, sea-plane mounted above it. As the composite craft gained flying altitude, it would use the fuel of the flying-boat. After traveling for some hundreds of miles, the units would be detached; the sea-plane finishing the flight while the flying-boat returned.

Mechanical Engineering makes the following comment:

"The fact that the Air Ministry seems to be officially interested in the experiment (with an eye possibly on the use of a similar combination to facilitate the start of a heavily laden long-distance bomber) suggests that the scheme has more aeronautical merits than are obvious at first sight. It is expected that flight trials of the composite aircraft will start in August."

Campus Snapshots—

Fibrous glass is spun at the rate of 260,000 feet per minute, which is 50 miles per minute, or 3,000 miles per hour.

Be Sure Rather Than Sorry

IN spite of the increase in motor vehicle deaths in the United States during 1935, the National Saftey Council is going forward with renewed vigor to reduce traffic accidents 35 per cent by 1940. Since the population increased approximately one per cent, the death rate per 100,000 population was 28.5 in 1935, the same as 1934.

It is significant that auto registration advanced 4.3 per cent from 1934 to 1935 while gasoline consumption went up to almost 6 per cent. It is logical to assume that there was an increase in the number of miles the average motorist was able to travel without an accident.

Had fatalities increased directly as the motor car registration, the 1935 death toll would have been 37,500 instead of 36,400, and had they kept pace with gasoline consumption there would have been over 38,000 deaths.

The eastern states, including New England, reduced their fatal accidents by three per cent as compared with the year previous. Massachusetts and Rhode Island showed the most prominent decreases of 19 per cent and 15 per cent, respectively. Of the midwestern group, North Dakota, Illinois, and Minnesota led with decreases of 23, 12, and 8 per cent respectively. Florida and Mississippi were outstanding in the South, while in the West, Oregon, Utah, Wyoming, and Montana all showed reductions of more than 10 per cent.

—Courtesy Better Enameling

DEATH BEGINS AT FORTY!

The Passamaquoddy Tide Control Project

(Continued from Page 4)

tion may be used to supplement the tidal plant. Along with the possible auxiliary station; the power house, a series of rock fill dams, filling gates, and a navigation lock comprise the project.

Work Accomplished

One of the most interesting parts of the preliminary investigation work is the core drilling in deep water, to determine how well the clay covering, which varies from a few to 100 feet over the underlying rock, will be able to stand up under the enormous pressures which will be exerted by the rock fill dams. This information is necessary, because, if the clay should squeeze out from under the dam, it will take three or four times the calculated amount of rock for the construction, and in addition, there will be no way of determining when the settling will cease. For this information, undistributed core borings were necessary. Under the vigorous natural conditions that these borings were made, unusual equipment was required.

The dams will range from 30 to 150 feet in height and up to approximately 3,500 feet in length. Due to the great velocity of the water during the tides, the rocks which form the face of the dam from elevation -30, and upward, will have to be approximately 5 to 20 tons in weight. These large rocks will probably need to be granite, which is transported about twenty miles by water. The local diabase rock supply will not break up into these huge blocks.

The powerhouse will have 10 units of 15,000 KW capacity for the initial installation. These are designed to operate at about 40 R.P.M. with heads varying from 5 to 25 feet. The estimated annual production is about 336,000,000 KWH. Due to the great expense, and the uncertainty of its success, a completely automatic system for the operation of the Quoddy plant will not be used. Rather, a semi-automatic system will be installed to aid the operators in running the plant most efficiently.

Along with the other preliminary studies, much experimentation is going on to determine the most satisfactory materials for use in the turbines of the power house, as well as for the other parts of the job.

The funds for carrying on this project are practically exhausted, and, due to the animosity of Congress, no more money was voted to continue work on the scheme. Therefore, the whole plan seems doomed unless President Roosevelt succeeds in getting more money appropriated. At present, the work which has been completed consists of building Quoddy Village, excavating material at the site of the navigation locks, and building the small dams which connect Moose Island with the mainland. Even if the project is abandoned, these small dams will replace the present trestles of the Maine Central railroad line to Eastport. They also fit into any plan which may be adopted if the work is continued. Much information has also been secured on materials and foundations for the va-

(Continued on Page 24)

CARROUSEL

(Continued from Page 7)

With the coming of evening, there was an influx of young couples who had come for the dance. John and Chuck were at an advantageous position near the gate and found time to watch the girls as they came in.

"Boy, look at that dress!" exclaimed Chuck. A formal made of printed voile brought the comment.

"Ya, and look at that blonde!" commented John as he jerked his head in the direction of a girl just entering. She wore a long black satin formal that hung tenaciously to her body, accentuating some breath-taking curves. It was not only the appearance of the girls that drew comments, but rather that they were dressed so inappropriately. Their long formals dragging through the dust lent a grotesque atmosphere to the carnival.

By midnight, most of the crowd had left, and the men were awaiting the word to tear-down. Standing the entire day left them with little ambition to work, but even the tear-down would offer some relaxation.

"O. K.! Start tearing down!" ordered Al.

In the twinkling of an eye, two booths were down and the merchandise ready to be checked-in. After Al finished settling for the bill (it had been a good day), the big-top was taken down. The feeling that soon they would be finished was stimulus to the men. The truck was loaded in total darkness. The only casualty was the bump on John's head where Chuck erringly swung a two-by-four he was carrying.

At 2 a. m. Chuck pulled out with his load of "dead-tired" men and equipment. His two companions in the cab dozed, while the other two sat in the back silently watching the road slip quickly from under them. All of a sudden, they found themselves thrown forward as the truck swung off the road and stopped!

"What the heck?"

John jumped off and ran to the front. Chuck was excitedly looking about him. He looked at John and grinned sheepishly.

"I guess I must have dozed off, and when I awoke, I thought that I saw a car crossing right in front, so, I tried to avoid it!"

The men did not sleep coming in the rest of the way! It was three before they pulled in, and four before the truck was unloaded. Half asleep, barely standing, the men started for home.

Societies Announce New Officers

TAU BETA PI

N. Schoeppel ..... *Pres.*
E. W. Hough ..... *Sec.*
H. E. Skinner ..... *Treas.*

A. I. C. E.

H. A. Hashbarger ..... *Pres.*
R. G. Penner ..... *Sec.*
J. G. Hunter ..... *Treas.*

THETA TAU

H. D. Townsend ..... *Pres.*
G. R. Johnson ..... *Vice Pres.*
R. F. Batt ..... *Sec.*
R. C. Purl ..... *Treas.*

SYNTON

H. M. Flora ..... *Pres.*
R. Kempf ..... *Vice Pres.*
H. McSkimin ..... *Sec.*
D. Chinlund ..... *Treas.*

CHI EPSILON

H. E. Skinner ..... *Pres.*
F. B. Henderson, Jr. ..... *Vice Pres.*
W. E. Willard ..... *Treas.*
W. A. Renner ..... *Sec.*
R. Zaborowski ..... *Assoc. Ed. Transit*

PI TAU SIGMA

J. W. Spalding ..... *Pres.*
G. H. Logan ..... *Vice Pres.*
T. N. Hackett ..... *Sec.*
R. E. Donnelly ..... *Treas.*

KERAMOS

N. Schoeppel ..... *Pres.*
W. M. Turner ..... *Vice Pres.*
La Verne Ekholm ..... *Sec.-Treas*
P. M. Wheeler ..... *Herald*

A. S. C. E.

E. G. Robbins ..... *Pres.*
R. F. Hastings ..... *Vice Pres.*
H. E. Skinner ..... *Sec.*
R. H. Gade ..... *Treas.*

A. I. E. E.

J. G. Parnell ..... *Pres.*
J. M. Miller ..... *Vice Pres.*
W. P. Hoban ..... *Sec.*
E. Cwiklo ..... *Treas.*
R. L. Hull ..... *Pub. Man.*

A. I. M. M. E.

E. C. Adams ..... *Pres.*
J. W. Sherman ..... *Vice Pres.*
M. Retonde ..... *Sec.*
L. Totft ..... *Treas.*

A. S. M. E.

G. H. Logan ..... *Pres.*
R. E. Donnelly ..... *Vice Pres.*
E. J. Wellman ..... *Sec.*
W. W. Peters ..... *Treas.*
C. W. Tarpley ..... *Pub. Mgr.*

S. B. A. C. S.

F. Hummel ..... *Pres.*
M. L. Cowles ..... *Vice Pres.*
A. K. Porter ..... *Sec.-Treas.*

RAILWAY CLUB

R. J. Kirsten ..... *Pres.*
C. F. McCann ..... *Vice Pres.*
M. J. Goers ..... *Sec.-Treas.*
W. H. Janssen ..... *Pub. Rel.*

There is an average of one filling-station to every mile and one to every half-mile of surfaced highway in the United States.

"I can't marry him, mother, he's an atheist and doesn't believe there is a hell."

"Marry him, my dear, and between us we'll convince him that he's wrong."

Scotchman—Now then, son, double up your fist tightly, like this.

His Wife—Say, teaching our boy how to fight?

Scotchman—No, I'm teaching him how to carry a penny to Sunday school.

In the olden days little girls worked knights, too!

TECKNOKRAKS

Soph—Why don't you major in pharmacy?

Dumb Frosh—Oh, no! I couldn't think of living on a farm all my life.

The difference between a pretty girl and an old maid is that the girl always has a lot of handsome men in her wake while the old maid only has them in her sleep!

A pedestrian is a case of survival of the flittest.

"My wife ran away with my best friend."

"Was he good-looking?"

"I don't know. Never met the fellow!"

"The trouble with you is, you're seeing crooked."

"That's strange. I'm full of straight whiskey."

"Waiter, there's a fly in my soup."

"That's quite all right, sir, it can swim."

Some girls are like roads, lots of curves, soft shoulders, and you can't tell where they will lead to.

During dinner one day a father spoke to his son: "Sonny," he said, "I want to talk to you after dinner. I want to discuss with you the facts of life." So after dinner when they went into the other room, the son quietly closed the door behind him and said, "Well, Dad, what is it you would like to know?"

"Viola, I love you. I want you tuba mine. I lay my harp at your feet."

"Aw, quit stringing me along. You can't get to first bass with me."

"Say not this: 'I'm tired of playing second fiddle!' You've got too many guys bowing you around."

"Oh, what a violin sinuation! What brass! Why did you piccolo thing like that to say to me? I ought to give you a baton the head!"

"Yeah? Gee, I'm trebling all over!"

"You'd better tremolo-ver what you said. I'm liable to drum you yet."

"Oh, but, suite, let's give this a rest."

"Oh! Trying to snare me in double quick time, eh? Well, quit horning in. Gwan! Blow!"

"Well, fife not been a chump! After all the do I've spent a music you! That's a scaly trick!"

"Say, I'm tired of listening to your chorus language. You're not so sharp. I'm leaving you flat."

"Well, Ill be ————!"

Some girls are temped to show off their figures, while others show off their figures to be tempted.

Most girls embark upon the sea of matrimony because some man gave them a sails talk.

"Now that I've told you about my past, do you still want to marry me?"

"Yes, beloved."

"I suppose you'll expect me to live it down."

"No, I expect you to live up to it."

"I let Barry kiss me last night."

"For shame!"

"No, no, no, for enjoyment."

Barmaid—Oh yes; I married a man in the village fire department.

Soldier—A volunteer?

Barmaid—No, pa made him.

Passamaquoddy Project

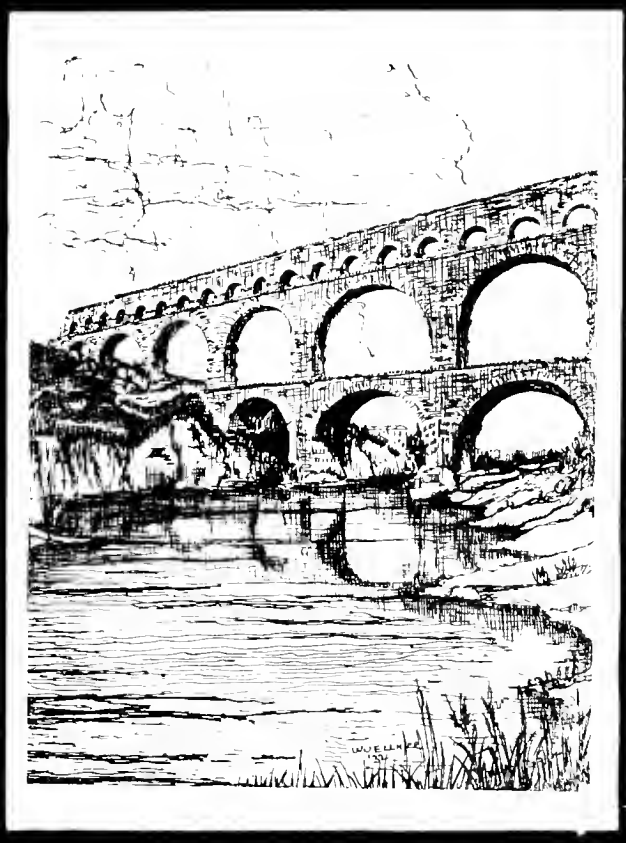
(Continued from Page 21)

rious dams and other structures needed for the project.

The cost of the undertaking and materials necessary to complete it are not at all certain. The closest estimate that can be made for the present plan will be around $40,000,000. With this cost of construction, the interest on this money at 4 per cent per annum will amount to about five mills per kilowatt hour—not counting depreciation and operating expenses. This excessive cost will not permit transportation of power for two hundred miles or more to industrial centers, nor will it attract industries to it, since a modern steam plant can wholesale electricity at the switchboard for approximately three miles per kilowatt hour.

With these facts before us, which show that the work is not economically sound, it is hard to predict whether we will see the dawn of a new kind of power, or whether we have seen the passing of Passamaquoddy.—H. E. G.

THE ILLINOIS TECHNOGRAPH



MEMBER OF E. C. M. A.

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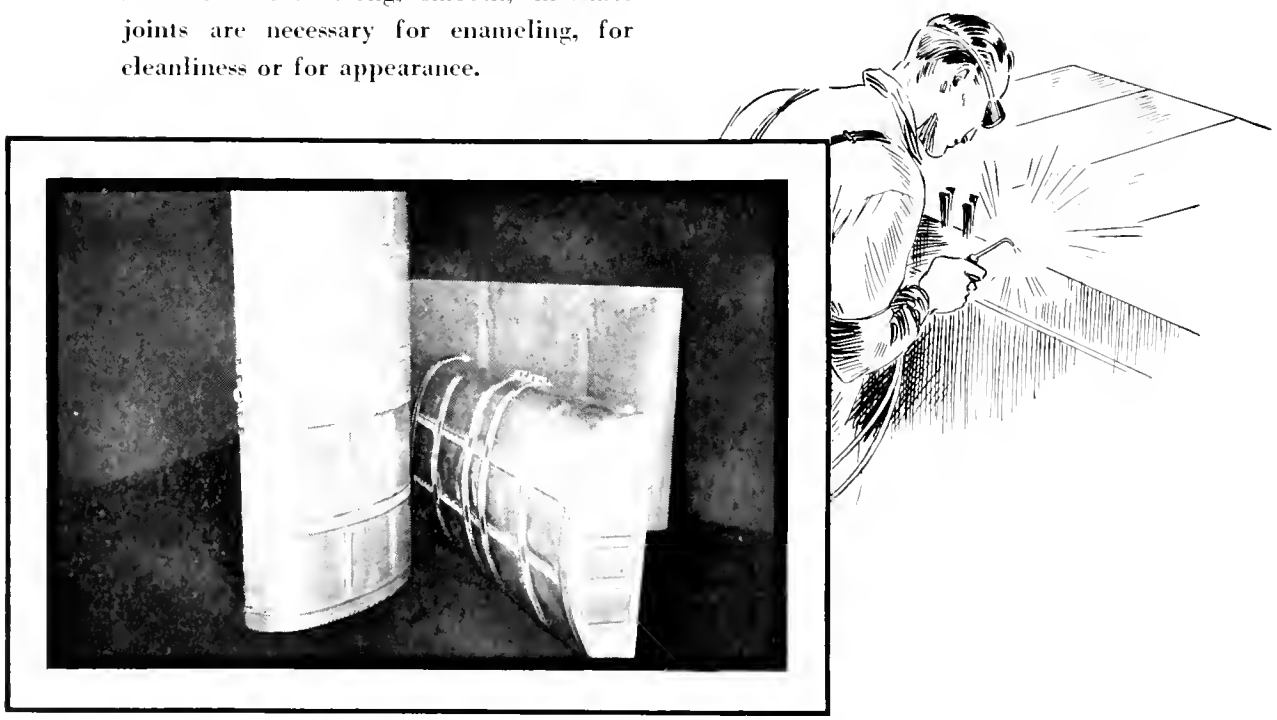

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THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

DECEMBER, 1936

Volume 51 Number 2

EVERY engineering student is interested in research, particularly in his own field. The Technograph gives you an intimate depiction, hardly comprehensive, but certainly interesting, of investigation being carried on by the different departments of the College of Engineering.

• No doubt all readers of the Technograph will be interested to know that the erstwhile Mr. Chu offers the results of his intensive study on *Factors of Success* in the story entitled, "Mr. Chu Probes Lives of Great Men." While the suggestions may be indefinite, the reading is certainly entertaining.

• How many students are aware of the importance of Ceramics? Surely, not overmany. In bringing you an absorbing article about the versatility of ceramic products, the Technograph continues its policy of being the college magazine and not some one departmental organ.

• Once again Illini engineers made their traditional inspection of industry. Instead of one story covering the entire trip, the Technograph brings you short but intimate accounts written by actual participants of the four biggest departments. According to these men, industry is encouraging.

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Modern Modes of Transportation

Courtesy, Technology Review

THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume LI DECEMBER, 1936 Number 2

ENGINEERING RESEARCH

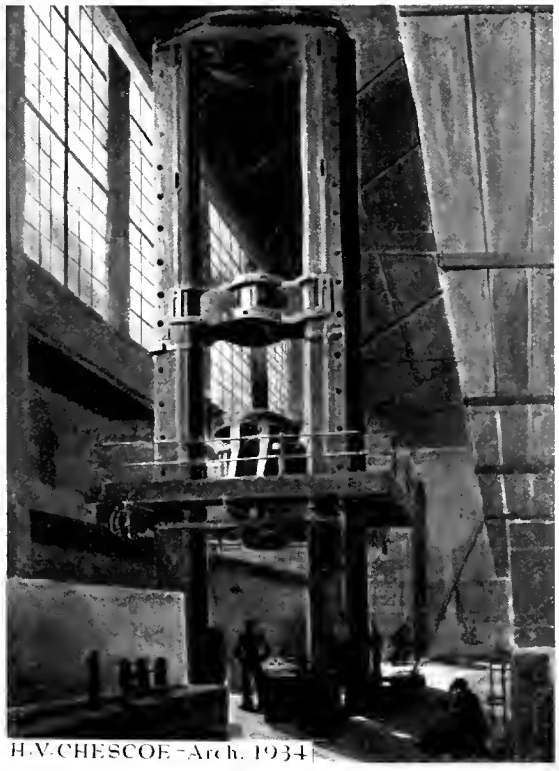
Extensive Study Benefits State as Well as Industry

WHAT is being done at the University of Illinois along research lines in the College of Engineering? Every student in the college should have some idea of the specialized experimentation that is being carried on with the daily instruction. Most of us have some particular field which interests us most, and we keep well informed about the latest developments in that field, but what about work in related departments? Many times information secured from other lines of work helps us in the solution of our own problems. A brief survey of research work being carried out in some of the departments of the college should give every student something to investigate.

All research in the College of Engineering may be said to be carried out with the Engineering Experiment Station. The purpose of the station is . . . "to conduct investigations and make studies of importance to the engineering, manufacturing, railway, mining, and other industrial interests of the State." In order that the outside public may have easy access to the results of its scientific investigations, the station publishes and distributes bulletins. To date 284 bulletins and 26 circulars, presenting information of timely interest, which is not readily secured from other sources, have been published. Nearly $100,000 is spent by industry every year in carrying out investigations. All of the College of Engineering, from the imposing Materials Testing Laboratory to the most secluded shop, is the Engineering Experiment Station.

Because most of us like to see what we are working with, materials testing on a large scale proves very interesting. If the analysis is carried far enough, however, it is easily discovered that miscroscopic crystals and invisible molecules are actually being dealt with rather than steel I-beams or reinforced concrete bridges.

One of the most recent problems to be attacked by the research staff in the Materials Testing Laboratories is that concerning reinforced concrete bridge slabs. This work is especially important in relation to concentrated wheel loads on bridges. The procedure used in carrying out this work consists of a preliminary mathematical analysis and subsequent laboratory tests. This project has been taken in co-operation with the Illinois Division of Highways and the United States Bureau of Highways. The investigation of rigid frame bridges undertaken in co-operation with the Portland Cement Association is composed of two divisions: (1) tests on a series of rigid-frame bridges, and



H.V.CHESCOE-Arch. 1934

A sketch of M. T. L.'s three million pound testing machine

(2) tests of a large number of knee frames. These rigid-frame bridges find a varied application in highway grade separation projects. Bridges with spans of thirty feet will be tested in the southwest corner of the crane bay. The "C" shaped pieces of concrete, which will be seen on the southeast side of the crane bay, are the knee frames being tested. Separate testing of these knee joints permit the study of a greater variety of corner shapes, such as fillets and brackets of various kinds, than could be taken care of with the bridge tests. Different types of hinged and fixed bases are used with the bridge structures, which have other variations in design as well, in order to determine the effect of such variations on the strength of the bridge.

On the east side of the basement of the laboratory will be found a machine which at first glance makes one think of a walking beam engine, but this machine is an ingenious engine of destruction. Repeated-load tests of riveted joints are made with it. The action of riveted steel members under alternate stresses of tension and compression is being investigated. This work is done in co-operation with the California Department of Public Works from funds made available in connection with the building of the San Francisco-Oakland Bay Bridge.

Welding is becoming more and more a tool of industry, but much work over a period of many years has not brought the welding operation under complete control in many desired applications. Investigations of welded structures are being carried on in order to determine the possibility of welding the steel skelton frames found in building construction for complete continuity. Five types of connections are being studied. This work is done in co-operation with the Hollup Corporation. Another type of welded construction is being examined in the testing bay. Those tall cylindrical shells around the testing machines in the crane bay are having their strength tested by M.T.L.'s 3,000,000 pound testing machine, the second largest in the world. These specimens vary in size, the dimensions for one are: length, thirty feet; diameter, four feet; and thickness, one-half inch. These test cylinders were fabricated by butt-welding with a shielded-arc electrode four belts of steel seven and one-half feet wide. These relatively thin cylindrical sheets were considered as supports for an elevated water tank.

During the past ten years tests on cast iron pipe and fittings have been sponsored by the American Standards Association. The objects of this experiment were to study the resistance of the pipe to bursting, bending, and impact; and to study and compare the strengths of pit-cast and centrifugally cast pipe. Another investigation which has been worked on over a long period, is the Rails Investigation. The most

recent problem set upon by these research workers was the failure of rails in service. At the present time their work has reached the point of determining that the cause of the failures was minute amounts of hydrogen included in the rails during the process of manufacturing.

Ceramic Glass Experiment

After reading about the largest testing jobs in the Experiment Station, it might be some relief to move to the east side of the engineering campus where the ceramic students spend their days and nights learning to handle the molecules and atoms of their materials. Research work in that department is directed toward measuring the physical properties of glass of various chemical compositions and subjected to various initial treatments. In the laboratory will be found several different types of electric furnaces. These furnaces have their heating units made of a molybdenum alloy wire that is surrounded by a medium of pure hydrogen to prevent destructive oxidation which would occur at the high operating temperatures if oxygen were allowed to come into contact with the wires. A very interesting instrument in this laboratory is a polariscope. This instrument helps us to form a conception of what a material in a strained condition feels like. Such instruments find application in industry for determining if a piece of glass or other material is initially strained when leaving the furnace. In one type of glass, a strained condition is intentionally sought. In the manufacture of non-breakable lenses for shop goggles, this condition in the face of the glass lens makes it hard, so that particles impacting on its surface are caused to bounce off again. Another one of the physical properties of glass measured, is the thermal coefficient of expansion. This is measured by an interferometer, an instrument developed in the laboratories of the United States Bureau of Standards. This coefficient is of value in determining what glass shall be used in lamp bulbs to hold the lead-in wires, since both the glass and the lead-in wire must have the same coefficient of thermal expansion in order to prevent the breaking of the air tight seal.

While we are on slight speaking terms with the electron and proton, it would be a good idea to see what the Electrical Engineering Experiment Station is doing. The experimental work of this station is centered around a number of problems in connection with electrical oscillations and vibrations.

Mechanical and mining engineers, as well as electrical engineers, would be interested in the first problem. It is concerned with the practical applications of Piezp-electricity. This electricity is produced from quartz and other crystals when subjected to mechanical stresses. It is somewhat remarkable that this little known property of certain minerals which was discovered over fifty years ago should become indispensable now for the operation of radio broadcasting stations. Self-sustained vibrations of quartz and plates in flexural and longitudinal vibrations are being studied at the station at the present time.

Corona Discharge

The second problem is connected with corona discharge which is usually produced on wires and in cables subjected to high electrical potentials. These discharges are always the source of loss of energy and of deterioration of insulation. It was discovered in the University of Illinois laboratories that these discharges are often accompanied by electrical pulses and oscillations. Research has led to the utilization of these rapid electrical variations of current for the purpose of detecting the presence of corona discharges in cases where they cannot be perceived by visual or audible methods. The physical properties of these corona oscillations produced by applying continuous potentials are investigated by means of cathode ray oscillographs and wave meters.

In the third problem electro-mechanical vibrations are utilized in connection with a fundamental question of magnetism: What is the value of the smallest, indivisible, and ultimate unit of magnetism called the magneton? The theoretical value of this unit of magnetism is known, but a precise determination is still lacking. An attempt is being made to measure the precise value of the magnetic moment of a hydrogen atom which theoretically should be equivalent to one magneton. This investigation is of fundamental value in the advancement of our understanding of the magnetic circuit. The work is being done by the Electrical Engineering Experiment Station in cooperation with the Physics Department.

E. E. Research

In the east basement of the E. E. Laboratory, a large electromagnet, vacuum pump, and other apparatus have been set up to perform the experiments necessary for the solution of this research problem. The procedure of the experiment is to produce an atomic ray of hydrogen in a vacuum, and transmit it at a speed of about 3,300 feet per second, or about 2,200 miles per hour, between the poles of a strong magnet where the ray is split into two equal parts. From the amount of deviation of the rays from each other and the velocity of the atoms, their magnetic moment may be determined. The given problem has then been changed into the problem of determining the speed of the atoms and of selecting those atoms which have a definite known speed. An apparatus called an atomic velocity selector was constructed in order to solve the two problems. Two moving slits having a frequency of 9,000 vibrations per second move in opposite directions past each other. From the known frequency and the distance between the vibrating slits, the velocity of the atom can be determined. All atoms having velocities different from the required one will be detained by the solid material around the slits.

The writer has made no attempt to cover every research project on the engineering campus, but he has attempted to touch upon those projects which the student sees and wonders about and upon those he does not see, and, therefore, cannot know about without reading. The writer is very much indebted to many of the research staff for their time and effort in supplying much of the information contained in this article and especially to Professor J. T. Tykociner of the E. E. Department for the discussion of research in the Electrical Engineering Department.

—M. E. H.

The Materials Testing Laboratory—Heart of Engineering Research

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British weather men have sent instruments to America to collect samples of air from the American atmosphere.

An automobile that used moth repellent for fuel was turned out in the eighteen-nineties, but the fumes made it unpopular.

Italy is getting various by-products from tobacco, including an edible oil, an industrial oil, stock feeds from tobacco seed, and paper from tobacco stalks.

Utilization of Ceramic Products

REVEAL

A New Engineering Field

Survey of Ceramic Indnstries Shows New Products Gain in Popnlarity

•

HUNDREDS of new products have entered the field of ceramics within the past few years, some of which are already familiar to us, and many of which have yet to make a public appearance.

All over the country today, there is a sweeping movement of rejuvenation and beautification of store fronts, filling stations, and theater facades. Since modern business is accustomed to using modern structural materials, it is not strange that porcelain enamel sheets are chosen for these improvements. Notable progress has been made since porcelain enamel entered the architect's office through the "kitchen door" in the shape of household appliances and kitchen utensils. It has found yet another field in building construction. One has but to look about to see the aesthetic and utilitarian uses to which this modern material has been put. Store fronts and building entrances are prominent among these installations. Many of them are marked by the generous use of colors since the porcelain enameler's palette is as unlimited as that of an artist's.

A modern version of the pre-fabricated home was seen at the 1931 World's Fair. It was a porcelain enameled, frameless steel house. Built without a single rafter, stud, or joint, this unusual house illustrated two new developments in building. The first is the pre-fabricated frameless steel method of construction, while the other is the use of enduring porcelain enamel as an exterior finish that needs no paint. With its seven large rooms, two baths, ample closet space, garage, laundry and heater room, and a solarium and sun-deck on the roof, this modern home demonstrates what the home buyer of today can expect in the five thousand dollar class. The thought of being able to bathe the house with the garden hose to restore its original freshness is interesting.

Excellent Properties

Porcelain is an ancient material in a new service. It is extremely durable; its colors do not fade; it will not crack or chip easily, and quick changes in temperature do not affect it. The frameless steel house is fire resistant, termite and vermin proof, lightning safe, shrinkless, highly wind resistant, and extremely strong. This type of house can be erected in one week.

As a decorative feature, porcelain enamel has climbed to new heights. On the facade of the Music Hall in Radio City are three ornamental porcelain plaques which depict the song, the dance, and drama. These plaques are eighteen feet in diameter and are fastened to the wall of the building sixty feet above street level. They are comparable to the finest pieces of jewelry, and, with the lavish display of brilliant colors that are a part of the decorative composition, they lend an enchantment of beauty to the facade of the Music Hall that could not have been achieved by any other material.

Further proof of the versatility of porcelain enamel can be had by referring to an exhibit at the Fair in 1934 which aroused the envy and cupidity of all the women visitors—the model kitchen—complete in every detail even to the built-in enameled clock. The shining white porcelain enamel of the stove, kitchen cabinets, sink, and refrigerator reminded the spectators that this represented a revolution in kitchen design. It was the last word in just what that important room should be.

Bricks Find Uses

In the brick industry, a great amount of work is being done on reinforced brick slabs and pre-fabricated walls for the purpose of building cheaper homes. Many new types of design have been brought to the attention of the public through the need of new moderately priced homes. This demand has also developed a new kind of veneering which is actually brick slab. The production of thin brick slabs has enabled remodeling of a frame house without the expense of complete rebuilding.

A new building material with a shale base has been produced and manufactured under the name Rostone. It is a synthetic product which resembles Portland cement mixtures in appearance and color. Rostone is being used for store fronts, interior walls, ceilings, floor construction, hollow tile, brick and block, vases, and lamp bases.

Structural Glass

One of the latest products in the structural field of ceramics was first introduced in Europe as a glass brick; it was brought here in 1929 and was exhibited at the Century of Progress as the Owen-Illinois glass house. These glass blocks will withstand a pressure of 72,000 pounds per block. In addition to that, they are excellent sound insulators, and clean. Furthermore, they transmit light without a glare and are fireproof.

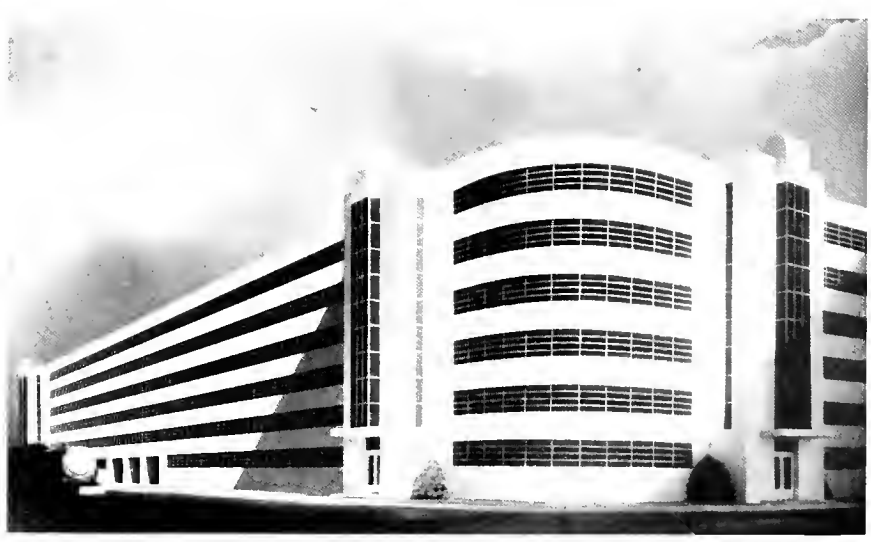
Today glass blocks are being used more and more in various places; however, it is the contention of the building authorities that glass bricks will find their real place in the homes of ten years hence. Perhaps the most outstanding structure built with glass blocks is the Owen-Illinois all-glass laboratory at Toledo, Ohio, which is a structure two stories high with no windows. The glass blocks permit an abundance of light to all parts of the building, and the modern air-conditioning system which uses glass wool to filter the dirt makes it a most pleasant laboratory.

Glass is also being used for the manufacture of glass wool. Glass wool and yarn are now being used as insulators for electric wiring and large cables, for it is fireproof and non-conductive. It may also be used as a vermin and moisture-proof blanket for buildings.

Advances in the field of ceramics have been immmerable within the last few years, and the new products which have been mentioned are representative of the entire industry. With many new products and methods of production, ceramics is, year by year, and day by day, encroaching on territory heretofore thought unavailable.

—J. H.

There are over 6,000 sizes and shapes of tin cans.



—Courtesy of Better Enameling

A Striking Utilization of Ceramic Products

ARCHITECTURE vs. ENGINEERING

How Misunderstanding Undermines the Efforts of Both Professions

"They are approaching the center of the ring folks! Both are coming out swinging—each bent on knocking the other out of the county in the first round. Kid Murphy swings from his knees, but Killer Kelly counters with a straight left to the Kid's ear. They go into a clinch. . . . W'ow! What a fight this has been folks. Every round just the same, both in there pitching for all they're worth. W'on't they ever let up? There's the gong! The fight is over, and I'll miss my guess if it isn't a draw. Ten rounds and still nothing has been settled between these two stubborn, fighting fools."

●

A SIMILAR situation has existed for years in the fields of bridge and building construction — the engineer and the architect each struggling to get along independent of the other. Every time the battle has ended in a draw. The engineer works in his methodical way to design economical structures, convenient in design, and strong in construction; the architect continues to put all of his inspirations into the design of a structure that satisfies the eye of the most critical artist.

Like most stubborn people, each realized that he was probably wrong, but did not wish to admit it. Nevertheless, when they found an opportunity to cooperate without embarassment to themselves, they were glad to accept. So, today, although appearing to be working independently of each other, the engineer and the architect are combining more and more to produce a greater number of beautiful, well-engineered structures.

Answer—Complete Cooperation

What is the argument about then? Here is the answer. Although the two professions are cooperating unusually well, exceptions are still too common. There are too many structures being built either from purely an architectural viewpoint, or else entirely from the viewpoint of the practical engineer to whom appearance matters little. Today there is a greater necessity than ever before for complete cooperation; partial cooperation being little better than none. When the engineer can design structures that will stand for countless years, it becomes very convenient to have the architect give the structure an appearance that does not become ugly or out-moded in a few years.

What is holding these two professions apart? What is keeping them from working together and reaching the peak of their efficiency?

Those Light-Headed Architects

There is still a strong tendency for the hard-boiled engineers around most industrial concerns to greet the approach of an architect about the way a dancing master would be greeted in a lumber camp, or a bathing suit salesman in Little America. Nor can the engineer be blamed when you think how often in the past these men have had to stand the gaff when the designer's pretty pictures have failed to turn into practical structures — structures which would serve utilitarian purposes instead of merely satisfying someone's craving for beauty. There have been so many slips 'twixt the architect's pencil and the engineer's slide rule, that it is natural for these practical men to stiffen at the mere mention of calling in an architect to fashion a shell for the engineers to fill with a scientifically designed skeleton.

Those Greasy Engineers

So the engineer pulls his hat over his ears and goes on the best he can. In the meantime, what is the opinion in the enemy's camp? Shuddering at the mention of those "greasy engineers" who have none of the aesthetic in their souls, the man who has spent years learning to transfer his "natural sense of the beautiful" to paper, gracefully waves his wrist and murmurs, "Ah me!" If the engineer is incapable of building the handsome structure which, according to the designer, "will make the world a better and more beautiful place in which to live," why should the architect worry? He has finished his job. So, with a "Ta-ta, old man," he dismisses the hairy-eared engineer from his mind.

Mind me now, lest I be condemned unfairly of having an erroneous conception of the whole matter. The above chatter is intended merely to show the tendency to exaggerate the contrast between the ideas and principles for which both sides stand; the engineer with his demand for physical perfection, and the architect with his passion for beauty.

Let's put a little reverse English on the ball and take a look at some of the masterpieces of the past. The Greeks built the Parthenon, an engineering feat of the "first water" in their day. Not only did they solve the problems of engineering the structure, but they left a building that has seldom been surpassed in beauty. In the three or four centuries following the crusades, there were erected in France, Italy, and Germany great cathedrals. Who was responsible for the design and construction of these masterpieces? They could not be called engineers, because it was not until years after the completion of the original structure that, through the trial and error method of repair, the buildings would stand for any length of time without collapsing. They could easily be called architects. These medieval cathedrals are considered by many to be the most beautiful buildings in the world.

Today, this type of construction is not necessary. Architects specialize in a beautiful bridge, building, or sky scraper. The engineers specialize in designing the same construction so that it will be strong enough to withstand the loads put on it and at the same time economical enough to be practical enough to warrant its construction.

The problem lies in getting these two specialized professions to exert their energies in the same direction. When this is done, we will have more structures like the Washington Monument, the Mormon Temple, the Empire State Building, and the new San Francisco-Oakland Bay bridge. The optimum of perfection of these two professions is reached when every new structure has the quality of these! THAT should be the goal of both the engineer and the architect!

—T. M.

—Courtesy Civil Engineering

Principal Applications of

Thermodynamics In Engineering

Power, Refrigeration and Heat

DO YOU know the meaning of the term thermodynamics? Probably most students have a hazy idea that it has something to do with heat. All engineering students take courses of study that require a little knowledge of the subject. The actual courses in thermodynamics, however, are rather complicated and require a considerable knowledge of mathematics, so that most students shun them. Thermodynamics may be defined as the science dealing with the application of the law of conservation of energy to a study of the thermal properties of different materials.

Most of the difficulty in studying thermodynamics lies in the intangibility of the thermodynamic properties of matter. The properties of volume and pressure may easily be seen and felt, but the meaning of such terms as entropy, enthalpy, and specific heat is very hard to grasp. The applications and uses of thermodynamics in engineering, however, are many, and are certainly tangible.

Power Production

The most general application of thermodynamics is in the production of power. Of the three great sources of power today, two—the production of power from steam and from internal combustion engines—are direct applications of thermodynamic principles. Water power, the third source, is not related to thermodynamics.

Because of the wide usage of steam as a source of power, much research has been carried on to determine its properties, and it has resulted in the steam tables that we have today, which tabulate the various properties of steam for easy reference. Other fluids, such as mercury, have been used to replace steam, but because water is so plentiful, steam is used almost exclusively.

Three international conferences have been held for the purpose of improving and extending international agreement upon the properties of steam. The latest of these conferences was held in the United States in September of 1931, and the present International Skeleton Steam Tables were produced then. The tables, in skeleton form, show accepted values for the properties of steam and give the limits of accuracy of the data. Research is still being carried on, both in America and abroad, in an endeavor to learn more about the properties of steam.

Efficiency Increased

The result of all this investigation is the increasing efficiency of steam power plants. In modern plants, higher pressures and higher temperatures are being used than formerly, so that the steam tables are necessarily being extended. When the steam engine was invented, practically nothing was known of the science of thermodynamics. Most improvements and developments in the field of steam power, however, have been made as a result of the application of thermodynamic theory.

The efficiency of internal combustion engines has been greatly increased by the application of thermodynamics to their construction. The two types of engines now in use, the Otto and the Diesel, are both developments resulting from thermodynamic research. Knowledge of the properties and actions of gas mixtures under the conditions of gas mixtures under the conditions that exist in engine cylinders is rather limited at present, but as it is being extended, the efficiency of internal combustion engines is increasing.

Refrigeration

Outside the field of power production, the most important application of thermodynamics is in the refrigeration industry. In producing power, energy in the form of heat is added to water, forming steam which drives an engine and thus the heat energy is converted into mechanical energy. In refrigeration, heat is removed from the cold chamber by the evaporation of a fluid, and is released outside the cold room from condenser coils. It is possible to use steam as a refrigerant, but other fluids which evaporate at lower temperatures are more practical. Ammonia is most used in commercial refrigeration plants and sulfur dioxide is the most common refrigerant used in household appliances. The thermodynamic properties of almost all refrigerants have been investigated and tables, similar to steam tables although not so comprehensive, have been compiled. The efficiency of any refrigeration unit is not expressed as percentage, but is called the coefficient of performance. The coefficient of performance is equal to the heat energy transferred from the evaporation coil to the condenser coil divided by the energy needed to operate the compressor. This is often more than one.

New Method of Heating

An interesting development in the field of refrigeration is known technically as the heat pump. The condenser coil, which gives off heat, is used to heat a building, and the evaporator coil is placed outside the building to pick up heat from the outside air. Air, at any temperature, has considerable heat content, and this heat is picked up by the evaporator coil and released inside by the condenser coil.

This heating method has two distinct advantages over the usual methods. One is that the coil connections may be reversed and the building air conditioned in the summer with the same equipment that heats the building in the winter. The other advantage is the high coefficient of performance of the heat pump. A great deal more heat energy is released inside the building than mechanical or electrical energy is used in operating the compressor. With our usual processes of heating, more energy is expanded than heat energy is released inside the building.

This type of heating equipment is not merely a theoretical development, for several installations have been made. One of the best known installations is in a building in Los Angeles, and another is used to heat a building in Salem, New Jersey. While acting as a heating unit, the system in Los Angeles has shown a coefficient of performance of from 1.45 to 1.98. That is nearly twice as much energy in the form of heat was released inside the building as was supplied to the compressor. The installation in New Jersey is later in design and has shown a coefficient of performance of about 2.3 in cold weather. This type of heating is best suited to moderate climates, since very cold weather lowers the coefficient of performance. Although these units are now in the experimental stage, it is expected that they will come into common use in the near future.

Air Conditioning

Air conditioning is still another of the numerous applications of the science of thermodynamics. The heating or cooling of a building are direct applications of thermodynamic principles. The regulation of the humidity of the air is also studied from a thermodynamical point of view. The thermal properties of moist air have been compiled in the form of psychrometic charts which show the relationship of temperature and humidity to the heat content of the air.

Another interesting application of thermodynamics is the commercial manufacture of oxygen. It is made by the fractional distillation of liquid air. Industry is now using pure oxygen instead of air in many combustion processes because higher temperatures may be obtained, greater economy of fuel is realized, and less combustion space is required.

On the surface, thermodynamics may seem uninteresting and difficult to understand, but further investigation shows it to be not only interesting, but also a very important field in modern engineering.

—B. N. McD.

Tests show that an automobile that will travel 18 miles on a gallon of gasoline at a speed of 30 miles per hour, will travel 12 or 13 miles on a gallon at 60 miles per hour.

SOUND PICTURES . . . .

Beginning and Development

THE motion picture came into being about 1890, when a man named Edison, famed as an inventor, decided that he could do the same for pictures that he had done for sound. His first motion picture machine greatly resembled the phonograph in principle, and was combined with it, so that the first movie was a sound picture. When his invention finally reached the market, in 1891, it was in the form of a peep-show. The spectator deposited his money, glued his eye to an opening, and turned the crank. He was rewarded by seeing and hearing a very short, poorly acted, and poorly reproduced show. The motion picture was not a success until years later, when means of projecting pictures onto a screen were perfected. At that moment our modern movie came into being. However, the sound feature was necessarily dropped; the mechanically reproducing phonograph did not have sufficient volume. Modern sound pictures had to await the development of the radio tube and modern electrical reproduction apparatus.

When you next attend a picture show, notice how much of your enjoyment depends upon the sound feature. Also notice how nearly perfect the sound reproduction is. It was not until the middle of the last decade that sound again became a part of motion picture shows. Thus, amination has been developing for the past forty years, but sound has been used only during the last ten years. Both, however, are now in approximately parallel stages of development.

Like all inventions and developments, sound pictures did not spring into being overnight. Men have been working for years in the laboratories, perfecting sound recording and reproduction to accompany pictures. The sound picture, in its first commercial venture, was a short. Then, because the public approved, it progressed to feature films with partial sound effects or a musical accompaniment. Finally, some enterprising producer used sound throughout the entire picture. He did not, however, take the chance of wasting a good picture. The first all-talking movies were notorious for their poor plots and rather low character, but the public would rather see a poor sound picture than a good silent one; so sound became universally incorporated with the motion picture.

Two Types

Since the beginning, there have been two types of sound pictures. Disk recording became practical first. In the past few years, however, it has given way to the photographic type in which sound is recorded on a sound track of the picture film.

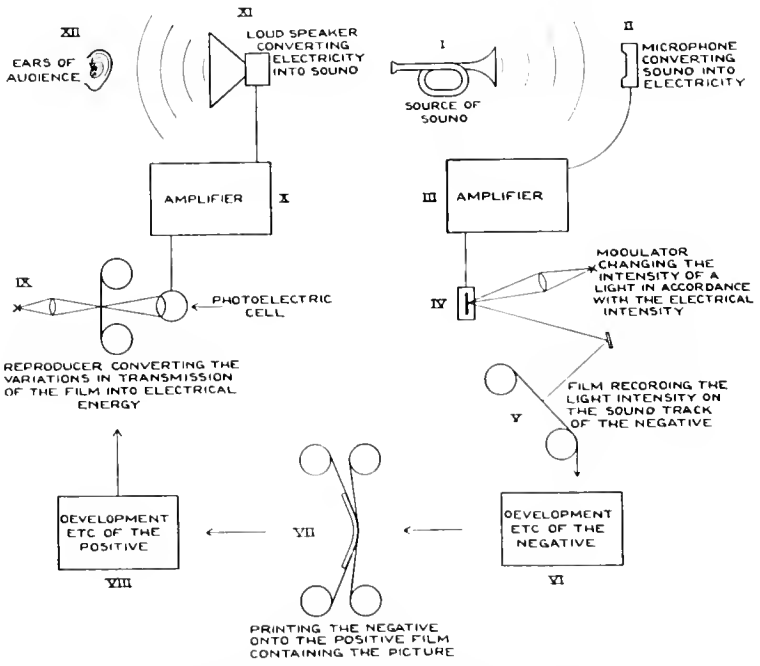
The disk recording is similar to the familiar phonograph record. The fine quality of our modern records is a result of the developments made by the motion picture industry. All modern recording is done electrically. The sound is picked up by a microphone, which converts the sound waves into electrical energy. This is amplified many times by an electric amplifier. This current is then transformed into mechanical energy by an electro-magnetic reproducer which cuts a record in wax. An impression is made of this wax record, and the hard surfaced records are made from the impression. There are two types of sound records cut into the wax by electro-magnetic reproducers. One is termed a lateral cut and the other, a vertical cut. The variation of the groove of the lateral cut is from side to side, but that of the vertical cut is in the depth of the groove. In reproducing from a disk recording, the variations in the groove vibrate a phonographic needle, which in turn, vibrates a coil in a magnetic field, or changes the pressure on a crystal of Rochelle salt. This produces a varying electrical impulse, which is magnified and converted into sound by loud speakers.

The photographic method of sound reproduction is also of two types. One is called the variable density, constant width method, and the other, the variable width, constant density method. In the first case, a varying electrical impulse from the amplifier is used to light a lamp. The intensity of the light given off from the lamp varies as the current. This light is shown on a moving film, and thus exposes the film to a varying degree. When a print of this film is made, the places representing a sound are lighter than the rest of the print. In making a variable width sound record, the electrical impulse vibrates a mirror or shutters, and the width of the beam of light reflected onto the film is varied. The portion of the film upon which the light is cast is transparent in the print, and the rest of it is opaque. The same reproduction machine can be used for both variable density and variable width recordings. A light shines through the sound track onto a photo-electric cell. This cell sends out a feeble current, which when amplified, is reconverted into sound by loud speakers.

Problems Created

Sound created many problems for the motion picture industry; so many, in fact, that only a few will be listed here. In the first place many of the actors and actresses did not have good voices and many of the rest of them could not act well when reciting their lines. Directors had to learn to be silent during shots. The scenarist had to learn to make the dialogue natural, for people were more critical of what they heard than of what they saw. All of these were easier to overcome, however, than many of the technical difficulties that presented themselves. Studios had to be sound-proofed. Also, they had to be made more nearly perfect, acoustically, to prevent any reverberation of sound. Cameras had to be synchronized with the recording apparatus. In many cases this meant using a power camera for the first time. The cameras had to be silenced, in fact, the industry is still searching for a truly silent camera. Direct cur-

(Continued on Page 23)



Courtesy Society of Motion Picture Engineers Journal

Steps in Sound Recording and Reproduction

MR. CHU PROBES ★ ★ ★ ★ ★ ★ ★ LIVES OF GREAT MEN

RECLINING on chair of Technograph office, Chu relax and make self comfortable. Soon good editor kicks door with big uproar and barges in with bad mood. Chu overwhelm by cyclone, fall off chair and almost lose consciousness. Editor start fireworks and order get story for big magazine of engineers. Big boss say Chu lazy, advise Chu get good article. During interim Chu exercise muscles through yawning and stretching, but as sudden as earthquake, Chu get urge and tell editor, "Very noble idea. Chu start work immediately and be rater in Who's Who."

Surprised editor comment, "What you going to do?"

"Chu go find famous men, what they do, Chu do and so be famous. Also give you good story on men. How about it, you like?"

"Excellent, get going," reply editor and Chu jump off window onto iron horse to seek famous men.

Skating on Boneyard

After reconnoitering several days, Chu find boneyard frozen and as he approach E. E. Lab., find Prof. Paine enjoy skating on historic river. Alighting from iron horse, Chu start research of great men by beginning with Hon. Professor of E. E. Dept. Chu first comment, "Nice place for skate, think so? Very good exercise, too."

Professor answer, "Very good, indeed, maybe Mr. Chu like join."

Chu take opportunity with Hon. Prof. and join party, Chu then start conversation. "Chu like imitate famous men. How about Hon. Prof. give desired information."

"Yes. Perhaps you are interest in my education? I go country school at Woodstock, Conn., and go high school at Willimatic, Conn. Then I receive B. S., M. S., and professional degree in electrical engineering from Worcester Polytechnic Institution," reply the Hon. Professor Paine.

The skate give Chu big workout and cause perspiration to occur so Professor ask, "Maybe you like swim to cool off? I find helpful and am fond of swim."

Swimming in Boneyard

Professor Paine talk into "mike" of portable transceiver and advise assistant shut off current of refrigeration and start machine thaw ice. Immediately, Chu see ice disappear and conversation resume self during swim. The professor tell Chu of experience in testing department of G. E. and as an electrical engineer of Lehigh Valley Coal Co. Leaving commercial field, Chu find Professor Paine as teacher at School of Technology, Stetson University and Professor of E. E. and Physics at North Carolina State College. Fortunate for Chu and E. E. students, the University of Illinois get him in 1907 and make him head of department in 1913.

The scenery of boneyard get tiresome and exercising scientific knowledge, the professor turn on infra-red rays and expose to Chu his hobbies of raising oriental puppies, callomine, and lily flowers on banks of boneyard. The flowers beautiful, but Chu bothered by goldfish emanating from lily pond into boneyard so Chu bids Professor goodday and thanks for information.

Chu Bewildered

Swimming away through boneyard, Chu see Professor Goff of thermo-dynamic fame. Chu wade out of boneyard and approach professor for advice. The professor busy in electrical prospecting and because it electrical, Chu stick nose into instruments and find it pertain to paleontological surveys. As things get deeper, the professor analyze the above effect by mathematics and the magnetic susceptibility of core-drill sample from data of electrical magnetrometer. Chu say to Professor Goff after pulling self together, "That deep stuff, maybe give Chu idea of your background so Chu can receive same and be famous."

Professor stop work and relate, "Why of course, I go grade school at Boulder, Colo., and High School at Wheatend, Wyo., two years, but graduate from Colorado City High School. After that I go Colorado Agricultural College two years and graduate from University of Illinois in 1921."

"Very good," say Chu and after more questions find that professor start teaching with late Professor Goodenough in fall of 1921 and receive M. S. degree in '24 and Ph. D. in '27. As Chu become more inquisitive, the humble Technograph reporter find the professor once work for the Linde Air Products Company on design of interchangers for production of liquid oxygen. In 1929, he go to Westinghouse Research Laboratories to work on problem relating to steam turbine design and general thermodynamic problems. Upon death of Professor Goodenough in 1929, he return to University as head of Dept. of Thermodynamics but is still retain by Westinghouse as consulting engineer.

Brushing technical aspects aside, Chu ask Professor of favorite doings in pastime. Professor reply, "Oh, I read, and sleep most of time like students, but I do students one better. I learn play on piano."

"Maybe play nursery rhyme," comment Chu. Music inharmonic and unpleasant, so Chu leave famous person in search of others.

Chu Learns All

Chu attracted by big fire in ovens of Ceramic building so run over with fire extinguisher but on arrival find everyone cool and calm. Amidst group of observers, Chu see big man with mustache smiling happily. Chu think to self and say, "That must be big shot. Maybe get explanation from him." Chu approach and ask, "What is magic material? You oblige and give Chu light on subject?"

Man reply, "That product you see is Dolomite Brick. We just find efficient way of making better and cheaper."

"Very important discovery. May Chu ask name, sir?" add Chu.

"My name A. I. Andrews and I . . ."

Chu interrupt and say, "Oh, Professor Andrews! Of course Chu hear of great person. Maybe like help Chu in his research?"

The professor answer, "Sure. What can I do for you?"

Chu start, "I wish material on lives of famous men. How about brief resume of Hon. Prof.?"

"Well, I have not very much to say except was born in Baraboo, Wis., go public schools at Oshkosh, Wis., and graduate from the Oshkosh high school in 1915. I enter University of Wisconsin 1915. I enter University of Wisconsin next fall but big war come along and I join U. S. Naval Reserve in 1918. Upon release in 1919, I go back to school and receive B. S. in chemistry in 1920."

"Exactly what Chu desire, but how about other works?" inquire Chu.

"After that I teach at University of Wisconsin and receive M. S. degree in 1921. Then I receive fellowship of U. S. Bureau of Mine's Ceramic Experimental station and Ph. D. from Ohio State University. My thesis about making of Dolomite Brick. Then I am research ceramic engineer for Dolomite Products Company, and in 1925 come to University of Illinois. I act as consulting engineer for A. O. Smith Co., since 1919 and year ago last summer I go to Europe for DuPont on special work," the professor add.

Chu then ask, "Maybe Professor will shed light on greatest work and enjoyment of spare time?"

The professor then say, "Perhaps the most important, research on subject of acid-resisting enamels and effect of gases on enamels. Maybe you know they can make tanks forty feet by twelve feet in diameter all in one piece. But as regard to spare time, I like fishing and spend time at cabin over in Danville and also take home-movies."

"Very excellent hobbies and interesting work, Chu thank noble figure for light on research."

Chu now write notes up and imitate famous men. Maybe reach top someday but hope you enjoy story now.

—E. H.

AMONG OUR SOCIETIES

MU SAN

At the first meeting of the year, on October 22, Mu San, municipal and sanitary engineering fraternity, elected the following officers:

President—H. W. Atkinson
Vice President—F. E. Wisely
Secretary—J. C. Deisenroth

On October 25 the fraternity held a dinner at which Dean Enger and H. R. Thomas, research assistant in sanitary engineering, spoke. Also at this meeting the first issue of Mu San News was distributed. This paper is being inaugurated this year to keep the fraternity in touch with its alums. It is planned to make this a monthly.

A. S. A. E.

President—F. Andrew
Vice President—R. F. Skelton
Secretary-Treasurer—R. Boardman

The Student Branch of the American Society of Agricultural Engineers, combined with the Agricultural Engineering Club, held their first meeting on September 30. At this meeting Frank Andrew gave an account of his trip with four other students to Estes Park, Colorado, for the national meeting of the A. S. A. E. He also demonstrated a development in electric fencing. On November 3 Professor S. A. Polson of the M. E. Department discussed Diesel Engines; and on November 18, C. W. Veach talked on the "Principles of Seed Cleaning Machines." The Program Committee is planning to have several outside speakers and a few discussion meetings. The Agricultural Engineers are also formulating plans for the national meeting of the A. S. A. E. to be held at Illinois next summer.

S. B. A. C. S.

President—F. Hummel
Vice President—M. Combs
Secretary-Treasurer—A. K. Porter

On October 8, Professor Clark of the Chemistry Department inaugurated this year's program of the Student Branch of the American Ceramic Society with a talk on what the ceramist should know about X-rays. Among their speakers in the near future will be F. C. Flint, president of the A. C. S., with a talk on "Personalities in a European Tour," and Professor Richart of the the T. A. M. Department with a talk on cements. On November 18, they held a meeting devoted entirely to student speakers.

A. I. E. E.

President—J. G. Parnell
Vice President—J. M. Miller
Secretary—W. P. Hoban
Treasurer—E. Cwiklo
Publicity Manager—R. L. Hull

With an attempt to stress student talks because of their importance in student development, the A. I. E. E. will have several during the coming year. About one-half of the remaining talks will be of a non-technical nature. Speakers from General Electric and the American Telephone and Telegraph Company are expected.

A. S. C. E.

President—E. G. Robbins
Vice President—R. F. Hastings
Secretary—H. E. Skinner
Treasurer—R. H. Gade

The Student Branch of the American Society of Civil Engineers started their year's program with a smoker on September 24, at which Professor Wiley, Gordon Jeppeson, and Professor Crandell spoke.

On October 7 they presented as their first speaker F. D. Chase, a prominent engineer and architect of Chicago. He discussed the manners and morals of an engineer. October 22, one of Illinois' most prominent graduates, John N. Chester, spoke on "Some Highlights of 15 Years of Engineering and Travel." L. D. Gayton spoke about an engineer's opportunities in the field of city managership on October 29. H. C. Hobble discussed political conditions in Spain before the society on November 18.

Other speakers the C.E.'s expect to hear soon are Col. J. P. Hogan, C. W. Breed, and Albert Smith.

A. S. M. E.

President—G. H. Logan
Vice President—R. E. Donnelly
Secretary—E. J. Wellman
Treasurer—W. W. Peters
Publicity Manager—C. E. Tarpley

On October 11 the M.E.'s presented three motion pictures entitled "Four-Cycle Gas Engine," "Magnetic Effects of Electricity," and "Refining Crude Oil," and on November 18 they presented a four-reel movie, "Steam." Emphasizing student participation, they will present a talk by M. S. Wilson on his trip through a steel plant and one by C. F. Erikson on his experiences in a ball-bearing factory.

The society's tentative program also includes: Professor F. R. Watson in conjunction with a sound film called "Sound," and Charles M. Wilson of the Scientific Crime Detection Laboratory. An inspection trip of the Danville zinc plants is being planned.

RAILWAY CLUB

President—R. J. Kirsten
Vice President—C. F. McCann
Secretary-Treasurer—M. J. Goers
Publicity Inf.—W. C. Janssen

The Railway Club started its program with a talk by C. H. Chang, on October 13. The club plans to have speeches by faculty members on high speed braking and railway economics. Other talks will be on high speed trains, rail testing, and interurban transportation.

SYNTON

President—H. M. Flora
Vice President—R. Kempf
Secretary—H. McSkimin
Treasurer—D. Chinlund

Synton, professional radio fraternity, held an open meeting on October 13, at which G. K. Green of the Physics Department, talked. Besides the regular weekly meetings, Synton will sponsor code instruction classes and classes in amateur radio. Other activities of the fraternity will include operation of the transmitter and handling of traffic.

A. I. C. E.

President—H. A. Hashbarger
Vice President—F. Winter
Secretary—R. G. Penner
Treasurer—J. B. Hunter

The American Institute of Chemical Engineers started their year's activities with a smoker early in October, at which Dr. Comings, new member of the Chemistry Engineering Department, was introduced. Dr. D. B. Keyes lectured on the aims and activities of the Institute. At the first regular meeting a moving picture, "The Manufacture of Whiskey," was shown. They expect to have Professor Fink, of Columbia University, talk on electro-chemistry, soon.

THETA TAU

President—H. D. Townsend
Vice President—G. R. Johnson
Secretary—R. F. Baff
Treasurer—R. C. Purl

Theta Tau, professional engineering fraternity, recently pledged the following men: W. M. Nagel, M. K. Carr, sophomores; and L. C. Atwood, and F. Usalis, juniors. The fraternity has among its aims the promotion of the principles of professional integrity and personal honor. At present the chapter here has members from students in the electrical, mechanical, and civil engineering departments.

PI TAU SIGMA

President—J. W. Spalding
Vice President—G. H. Logan
Secretary—T. N. Hacket
Treasurer—R. E. Donnelly

Pi Tau Sigma, the mechanical engineering honorary fraternity, is planning a smoker and several dinner meetings for the year. The pledging of new members was held on November 18.

ETA KAPPA NU

President—E. Cwiklo
Vice President—R. Hull
Treasurer—H. J. McSkimin
Secretary—A. Smeskal
Branch Correspondent—R. A. Kempf

At its first meeting of the year, Eta Kappa Nu, honorary electrical engineering fraternity, heard Professor E. B. Paine head of the Electrical Engineering Department, talk on the foundation of the society and the advantages of belonging. The fraternity's pledges for this semester are: A. S. Grown and F. A. Ghiselli, seniors; L. Bleuer, D. Chinlund, R. E. Jeffries, S. Ryder, D. Schick, Edmund Zawistanowicz, juniors.

KERAMOS

President—N. Schoeppel
Vice President—W. M. Turner
Sec.-Treasurer—La Verne Ekholm
Herald—P. M. Wheeler

At one of the initial meetings for the year, the honorary ceramics society decided to initiate one or more honorary members from industry. The individuals are to be selected by a faculty committee. It was also decided to sponsor the publication of a Ceramics Department yearbook, and to sponsor several social affairs for ceramic students.

LIGHTNING

—*Courtesy General Electric Review*

FLASH! The heavens are split by a blinding streak of light. There is a violent clap of thunder and then silence. The phenomenon of lightning has passed. There may be damage in its wake, or there may be no visible trace of its passing, but after it has gone, the question as to what really happened enters our minds.

Lightning is the visible flash accompanying an electrical discharge between two clouds or a cloud and the earth. The lower part of a thunder cloud can be visualized as one plate of a physically huge condenser, the air the dielectric, and the ground or some other part of the cloud as the other plate. The cloud itself is not a conductor, but it consists of many water droplets suspended in an insulating medium, the air. The charge is not on the surface of the cloud as many believe, but it is distributed in the water and the air throughout the cloud.

As the cloud moves through the atmosphere, it attracts opposite charges to the ground beneath, and a field is built up between the ground and the cloud, as between the plates of a regular condenser. This generation goes on until a discharge occurs in the form of lightning. When the discharge has taken place, the cloud is left with no appreciable amount of electrical energy, and the process of condensing must be repeated. If the convection currents which build up the charge are not especially favorable, the cloud does not continue to discharge. Some other cloud may be subject to more favorable conditions and charge quicker, thus forming a new center of lightning discharge. In this manner the center of electrical discharge shifts throughout the storm area.

The severity of an electrical storm depends upon the extent and violence of the convection systems, which in turn depend upon the temperature and velocity of the air movement. By determination of these conditions, the severity of a potential storm may be predicted.

Lightning occurs in three distinct forms: forked or zigzag lightning, sheet lightning, and ball lightning. The forked lightning is the vivid streak of white which appears to be running in an irregular direction and sometimes ramifies in branches or the limbs of a tree. Although it appears to be zig-zag, photography shows it to be of irregular sinuous character. Sheet lightning is the rosy red tint on the horizon that lights up the clouds. This is the most common form of lightning, and it is usually concealed from direct view by clouds. Ball lightning is the small globe of brilliant light moving through the air at a short distance above the ground or often on the ground "rolling." It has been known to "roll" through open doors and windows. It breaks up with an explosion, but is not of destructive nature. Of the three kinds, forked lightning is by far the most destructive.

The visibility of lightning is due to the electrical energy which forces its way across the interval of air being converted into heat, and the particles of air are set in such violent motion that they become luminous. The white hot air expands suddenly, and then contracts setting up a series of air waves along the line of flash. These vibrations reach the ear and are known as thunder. The extended rumblings that follow are the echoes and the reverberations of the initial vibrations which may be miles in length.

In the progression of a storm, a light sprinkle is usually followed by rain and heavy lightning which gradually abates, and a steady rain sets in with very little electrical discharge. Rain and certain "lightning conductors" discharge the electricity of the clouds quickly to the earth and usually prevent electrical storms lasting for a long time. The fact that the discharge limits of a cloud are very small accounts for the rapidity with which an electrically charged area disappears.

Lightning has the potential power to inflict great damage. The belief that it will strike only once in a particular place is entirely unfounded. Lightning has been known to strike the same object time after time. Damage to buildings in rural sections is five times that caused in urban areas. Structures built on chalk or marl are less likely to become the target of a bolt of lightning than those located on sand or clay. In wooded sections the oak is most frequently hit, while the beech is seldom injured. Human beings are frequently struck or injured by lightning; twenty-five per cent of such cases prove fatal. There is no absolute safeguard from the destructive power of lightning although lightning conductors or lightning rods on the top of buildings serve to equalize the potential of the earth and the clouds, and prevent a disruptive discharge.

—L. S.

CHI EPSILON

President—H. E. Skinner
Vice President—F. B. Henderson, Jr.
Treasurer—W. E. Willard
Secretary—W. A. Renner
Assoc. Ed. Transit—R. Zaborowski

Chi Epsilon, honorary civil engineering fraternity, held its first meeting of the year on October 22. The rushees for this semester were asked to this affair at which one of the speakers was Professor T. C. Shedd. M. L. Gossard and A. B. Bourgo, seniors; and the following juniors: L. L. Brivak, H. E. Goeke, L. R. Marcus, J. M. Robertson, L. E. Salch, and T. S. Scott pledged the fraternity soon after the meeting.

MINERAL INDUSTRIES SOCIETY

President—E. C. Adams
Vice President—J. W. Sherman
Secretary—M. Retonde
Treasurer—L. Tofft

The Mineral Industries Society is an affiliated society of the A. I. M. E. On November 4 they had as speaker Dr. George Otis Smith, former president of the A. I. M. E., former director of the U. S. Geological Survey, and member of the world power congress. Other speakers will include John Jones, safety engineer for the Old Ben Coal Company, and representatives from the Chicago and St. Louis sections of the A. I. M. E.

The society is also planning to have several movies similar to those entitled "Mining, Smelting, and Refining of Copper" and "Making, Shaping, and Treating of Steel," both already shown.

TAU NU TAU

President—H. D. Evans
Vice President—M. Lamb
Secretary—R. Purl
Treasurer—E. Olson
Sergeant at Arms—B. Larson

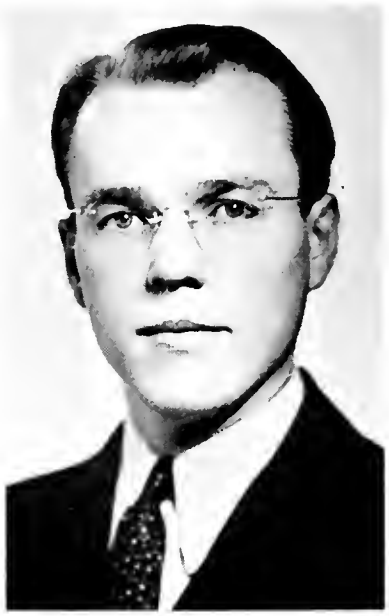
T. N. T., honorary military engineering fraternity, initiated the following juniors on November 16: S. W. Ryden, J. C. Sharav, B. T. Schwar, C. H. Dunn, G. R. Fouts, J. D. Dayton, M. V. Adams, L. J. McCleish, C. L. Wells, R. J. Houkal, J. C. McKibbin, H. W. Atkinson, C. O. Fahrnkopf, R. W. Dalrymple, S. C. Henninger, E. H. Holt, R. O. Beitel, J. M. Ericson, C. E. Wright, R. W. Benoliel, H. E. Goeke, R. D. Rodwell, J. B. Vernetti, and P. A. Nilsson.

TAU BETA PI

President—N. Schoeppel
Vice President—R. C. A. Purl
Secretary—E. W. Hough
Treasurer—H. E. Skinner

On November 3, Tau Beta Pi, honorary engineering fraternity, pledged the following seniors: E. Cwiklo, E. E.; M. Harvey, M. E.; H. J. McSkimin, E. E.; H. E. Oehler, Met. E.; R. E. Stampfle, Gen. E.; E. J. Wellman, M. E.; E. W. Zelnick, C. E.; A. Zmeskal, E. E.; and R. Zaborowski, a junior, C. E. M. P. Vore, Engineering Physics, was pledged as the junior with the highest scholastic record. The national convention of this society was held October 8 to 10 in Ithica and Syracuse, New York. R. C. A. Purl represented the student chapter.

• WHO'S WHO IN ILL



● *Wes Spalding*

● *Harlan Harshbarger*

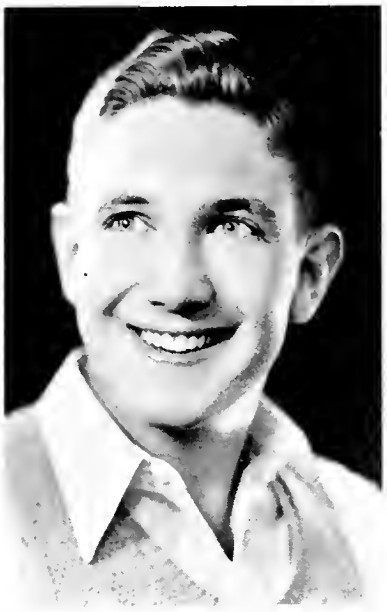
● *Dick Kirsten*

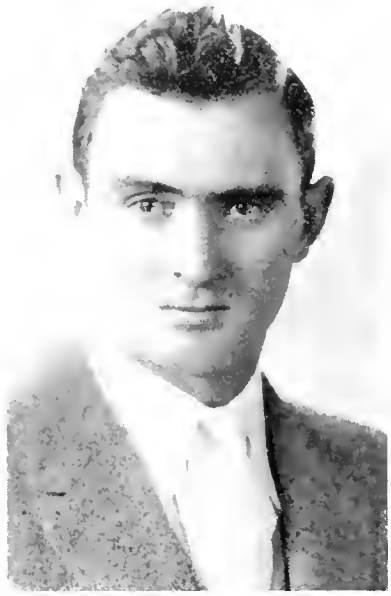
WES SPALDING may have taken advantage of his fellow M. E.'s, for back in his carefree pre-University days he used to tinker with motorcycles and under-slung speedsters. For this reason, or possibly because he's just naturally smart, he has really done things scholastically. He's in Phi Eta Sigma, of course; he's the Master of Initiation of Tau Beta Pi; and he won the Pi Tau Sigma award for having the highest average among sophomore M. E.'s. Incidentally, this didn't terminate his connection with Pi Tau Sigma; since then he has not only joined the organization but has become its president. Wes has done quite a bit of canoeing; some on the lakes of Wisconsin and more on the Fox River. He thinks it's great! For two years he expended his athletic energies as a member of the gym team (possibly the demise of the Man on the Flying Trapeze had something to do with his stopping this activity). And oh, yes! Wes can give you authoritative information on what's wrong with the University; you see, he works at the Health Service Station.

HARLAN A. HASHBARGER likes his military. He is Lieutenant-Colonel of the Coast Artillery Corps and has a chest full of medals for military achievements, principally for rifle and pistol marksmanship. Last Military Day he was presented with the Grand Army Memorial Saber, an award which distinguished him as the outstanding cadet officer of his class other than the Student Colonel. He's a member of Scabbard and Blade, the Coast Artillery Club, and Pershing Rifles. But don't accuse Mr. Hashbarger of being one sided. You must consider, for instance, that he's an up and coming chemical engineer; in fact, he is president of the American Institute of Chemical Engineers. He is a member of the Junior Board of the Student Alumni Association. He played freshman baseball and plays intramural basketball, tennis, and golf. Some might claim we are reverting to his first love by mentioning that he was a member of the Intramural Championship Rifle team in 1934; but we are *certainly* going into a new field by telling you that he is president of his fraternity, Sigma Phi Sigma. Our hero is mum about his hobbies, but it is a safe bet that he likes to put the old eagle eye behind a good sporting rifle, and woe betide anything that even remotely resembles a bull's eye!

DICK KIRSTEN, even under his more dignified appellation of Richard J. Kirsten, doesn't sound French. In fact, he is not French. But he is a full-blooded Parisian nevertheless, because 8,781 inhabitants of Paris, Illinois, *can't* be wrong. Dick had a hard time tearing himself away from his native night life, for he didn't enter the University until February, 1932, although the Paris High School said, "Enough" to him in 1930. In the interim, Dick worked in the Cummings Car and Coach company of Paris. The year 1933 saw him out in the fierce and frigid world again getting some more of that valuable product called experience. In 1934 Dick played prodigal, and he has been with us ever since. It is interesting to see what a man of experience thinks of our outside activities. Dick has been in the Railway Club for four years, and now as president represents the society in the Engineering Council. He is also a member of Sigma Epsilon (railway honorary). As a freshman and a junior he helped with the E. E. show, and as a sophomore with the Engineering Open House. Dick is in advanced military with the Signal Corps. His hobbies are varied and various. Chief among them are wood-working, tennis, and puzzles. He will probably get ahead on his own merits, because the chances are he wasn't spoiled back in Paris—he is one of seven children.

NGINEERING WORLD •





Ernest Adams •

John Parnell •

Floyd Hummel •

FLOYD HUMMEL hails from way up northeast—the Ceramics Building, to be exact. Although he delights in collecting arrow heads and old American coins, he has torn himself away from these intriguing pursuits long enough to do at least a few things here at the University. For instance, he hit the books so well that he rated Phi Eta Sigma and Keramos, and kept hitting them so well that he was initiated into Tau Beta Pi. After a long membership in the Student Branch of the American Ceramic Society, Floyd was elected president. Somehow he manages to get in a dash of intramural baseball and basketball, too. Each summer, invariably, he works for some firm manufacturing ceramic products. Floyd is so quiet a lad that it is hard to believe the folks back in Maywood; they say he's a devil in his own home-town. The only local endeavor that disturbs his characteristic calm is his fervor in the interests of the Student Branch of the American Ceramic Society. He wants to make the society known and respected throughout the University. Considering his general efficiency, Floyd probably will do it!

JOHN G. PARNELL certainly gets around. Very latest figures show that only fifteen of our glorious forty-eight states have escaped his flying feet, and he bids fair to hit these before long. Ever since he attained the lofty age of four, he has journeyed to far-off Ontario each summer. Perhaps it was on the way there that he went to Mexico. Anyway, he did get to Mexico, and it is said that the sight of an Aztec monument there so impressed him that he hastened to become an Illini the instant he became aware of our Indian tradition. It is surprising that John finds time to keep up with the comparatively local yokels, but lend an ear: As a junior he was secretary of the A. I. E. E.; this year he is chairman of the organization; and furthermore, he is the president of that august body, known as the Engineering Council. We feel duty bound to add a note of realism to the Parnell saga by stating that he underwent a year working in a grocery store before deciding to end it all and come to this, our alma mater. His first love among hobbies is a natural one for such a travel-minded young man; he has a yen for following very closely all the changes and improvements in succeeding models of automobiles.

ERNEST ADAMS, E. C. to the boys, is so versatile and proficient that we present him, for the benefit of dubious freshmen (and possibly upperclassmen), as a living example of "it can be done." To wit: Mr. Adams is a member of the American Institute of Mining and Metallurgical Engineers, and is president of the Mineral Industries Society. He belongs to Phi Eta Sigma, and is Cataloger of Tau Beta Pi. He is not only a Major in the Engineer Corps of the R. O. T. C., but attends meetings of Scabbard and Blade, and formerly those of Pershing Rifles. Add to these the fact that E. C. has found time to work his way through school and, as the saying goes, you have something there. Before coming to the University, Mr. Adams did everything from working on a stock farm to teaching in a country school. He hasn't had a great deal of practical experience in the engineering field, but no doubt he gleans considerable knowledge during off moments in the Engineering Library where he has been employed for some time. E. C. doesn't possess any hobbies in the true sense of the word, but he enjoys hunting and riding, and indulges in all the usual sports upon occasion. He dubs himself "about normal" socially, explaining that he hits all the big dances, and gets at least a bit of recreation each and every week-end.

THE RIGHT ANGLE . . .

The Engineer and Culture

It is time for the engineering student to realize that he cannot escape the scorn of society by balancing his ignorance of culture with the title of his profession. Culture is not an addiction of a spineless or insipid person, but rather the mental discipline and moral enlightment of a truly intelligent being. Beauty of thought and expression is made light of by the average engineering student, not because he has reached a premeditated decision, but, rather, because of sheer thoughtlessness. These individuals should wake up, for their fraternity is rapidly losing members!

A proper definition of culture is difficult to give. Excellent books such as John Cowper Powys's *Meaning of Culture* have been devoted to its detailed discussion. But what about its applicability to the engineer?

The engineering student is expected to undergo rigorous mental efforts. His ultimate success depends upon the extent to which he has developed his reasoning ability. Mental flexibility is vital to any technical analysis. What better way of developing this dexterity is there than to think intelligently about a wide variety of subjects?

Some engineering students might be surprised to know that there is music different from that which can be heard at the local dance halls every week-end. Just as many, however, enjoy and appreciate the more thoughtful music: the opera and the symphony. Mr. Sigmund Spaeth, an authority on music, said in a lecture on this campus two years ago that music could be divided into three classes: (1) music of the foot, (2) music of the heart, and (3) music of the mind. It is to the latter that the symphony belongs. The time spent in learning to appreciate its abundant beauty and expression is well worth while.

Art, too, consists of more than the full-page photographs on thumb-worn magazines. In every truly artistic production, there is an expression of thought, imagination, and an example of technical skill. It might be of interest to note that one of history's greatest men, Lenardo do Vinci, was both a great engineer and a great artist. One of his most outstanding paintings, *The Last Supper*, lives on while many of his engineering feats have been forgotten in the obscurity of time.

When art and music is complemented with philosophy, literature and religion, then one can be reasonably sure that he is fortified to attack any technical analysis with the mental alertness it deserves. A sound philosophy will enable one to maintain a sane perspective of fundamentals even when in the midst of a whirl of subordinate applications.

Everyone should help in stabilizing this process of cultural expansion. There is excellent opportunity for it at this university. The instructors can show their co-operation by relieving some of the student's harassment; the student can show his appreciation by the thoughtful utilization of his time.

Laboratory Learning

The relative educational value of laboratory work and other manual exercises as compared with the more passive types of learning activity has long been a subject of investigation and contention among psychologists and pedagogues. Here at our own University of Illinois there is ample material for consideration, especially in the College of Engineering. Each department offers a variety of laboratory courses, all designed, no doubt, to afford the student valuable practical experience as well as a better understanding of the machines, instruments, and procedures of which he reads and hears.

Undeniably, in some fields, laboratory work of some nature is indispensable, because it affords the only avenue of correlation between theory and practice that is available to the majority of students. But in other laboratory courses this point of view seems to have been lost sight of, or perhaps has never appeared. The objective in courses of this latter type seems to have degenerated to the engendering of mere manual skills; rather than remaining on the higher and broader planes of orientation between related fields of engineering, presentation of a perspective view of the profession, and inculcation of certain general patterns of what might be called engineering outlooks or philosophies.

One might readily defend the thesis that the degree of development of a philosophy of engineering which could be achieved in a length of time comparable to that spent in bringing about a certain amount of manual proficiency, would have more permanent, desirable, and far-reaching effects than the acquisition of a specific habit, the influence of which would necessarily be confined, more or less, to the sphere of activity in which it was developed. The crux of the matter lies in the decision as to the purpose of a university engineering curriculum. Is it to attempt to provide specific manual skills, or to give a general background upon which any necessary future abilities can readily be built? The generally accepted answer seems to be the latter, and from that point of view the actual valuable knowledge to be gotten from some laboratory courses is deplorably disproportionate to the time spent on them.

The purpose of this discussion has been simply to crystallize opinions which are more or less prevalent among engineering students, and it merely touches the surface of the problem it suggests. There exists, however, in some places, this undesirable state of affairs which seems to have acquired a sort of inertia through the years, and bids fair to continue indefinitely, just as a habit persists even though it is no longer suitable to new needs. As a step toward solution of the problem, one might suggest a poll of engineering upper-classmen to obtain their opinions and rating of various laboratory courses. The results would indubitably prove very interesting, if nothing more, to all concerned.

His job is to look for trouble before it happens. He is one of many who inspect telephone apparatus regulary, even when nothing is wrong. His work is called "preventive maintenance." ℂ. This work is of the highest importance. It helps to prevent interruptions to the service; often forestalls costly repairs, or replacements; helps keep telephone service at highest efficiency. ℂ. To plan this work requires management with imaginative foresight and the ability to balance the many factors involved in the maintenance problem.

BELL TELEPHONE SYSTEM

AMERICAN TELEPHONE & TELEGRAPH CO. BELL SYSTEM AND ASSOCIATED COMPANIES

Tonight—call up someone in the old home town—after seven, when rates to most points are lowest.

SENIORS INSPECT

M. E.'s VIEW PRODUCTION

The senior Mechanical Engineering students, along with four faculty members of the department, spent two and one-half days tramping through three manufacturing plants, a steel mill, and a power plant. It should also be said that about three or four nights were spent in proving that the engineer is able to find the white lights, as well as the play-boys on South Campus.

The Wisconsin Steel Works and the Crane Company were the places of interest during the one day in Chicago. Some idea of the importance of steel to industry can be obtained from the fact that, even in this relatively small steel plant, huge ladles, twelve to fifteen feet deep, and holding as much as 125 tons of steel, were in continuous use, filling train loads of ingot molds. A 7,000 horsepower motor, one of the largest used in all industry, was seen in the plant supplying the power for the rolls of a rolling mill where ingots a foot and one-half thick were squeezed to one-fourth of their original thickness.

After lunch at a south-side Y. M. C. A., the afternoon's trip through the Crane plant was undertaken. Old acquaintance was renewed with some Illini grads among the guides. The continuous processes used in the casting of small valves and fittings, and in the nickle-plating of small plumbing fixtures, such as are commonly used in homes, were interesting as examples of mass production methods. Some minutes were taken in walking through an immense storeroom, holding in its bins, parts for, and, assemblies of, some 40,000 products. Ingenious machines which required a human hand only to feed them, kicked out of their jaws hundreds of small fittings every hour, and gave the students an idea of what mass production means.

The M. E.'s arrived in Milwaukee in the early dawn of a Thursday morning with sleepy eyes, but with a good breakfast in their nether regions. All reported present at the Allis-Chalmers plant in West Allis after an invigorating ride in an ancient street car. Allis-Chalmers was remembered for the size of its manufacturing equipment, and its manufactured products. Men in the erecting shop were busy setting up a mine hoist having conical drums fifteen feet in diameter mounted on a shaft a foot and one-half in diameter and thirty feet long. In one end of this erecting shop is one of the largest boring mills in the world, with a table forty feet in diameter. In another part of the plant, a 3,000 ton hydraulic press shapes red hot steel forgings three feet thick as easily as you would shape a piece of clay.

After a generous lunch from Allis-Chalmers, in the employees' club house, the students spent the afternoon in the Kearney and Trecker plant a few blocks away. After spending the evening with the belles of Waukegan, and the following morning inspected the Public Service Company of Northern Illinois power station at Waukegan, all members of the party were ready to officially disband in Chicago, at noon, Saturday.

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CERAMICISTS SEE OPPORTUNITIES

Amidst singing, shouting, and a general atmosphere of unconcealed gayety, the senior students of the Ceramics Department returned Saturday, November 7, from a four day inspection visit of Ceramic plants in various parts of Illinois and Missouri.

They had good reason for their gay behavior, since every plant visited, with the exception of one, was working to capacity and several were rushing along on a 24-hour day schedule. On every side they received encouragement and invitations to "come back and see us after you graduate, we'll be very glad to see you." One can hardly blame them for their ill-concealed delight at

the excellent prospects of a job after graduation.

The inspection trip took them through five different cities into eleven ceramic plants, manufacturing everything from small glass bottles to large stoves and ranges. Among the organizations visited was the A. P. Green Firebrick Company, "the showplace of the ceramic world," now a $11,000,000 concern, although only eleven year old. Here all types of refractories are made, linings for locomotive boilers, bricks for blast furnaces, high temperature kilns, and special shapes for both domestic and foreign trade. Here the students were the guests of the company for luncheon, and were agreeably surprised when they were joined by former students of the University of Illinois now employed by the firm.

Among the other plants visited, was the National Enameling and Stamping Company, the world's largest producers of enameled kitchen ware.

The remaining plants visited included Blackmer and Post Sewer Pipe Company, the Winkle Terra Cotta Company, the Illinois China Clay Company, and several large refractory plants. These gave the ceramic students a well-balanced picture of what the Ceramic world has to offer to its men. And the fella's think it is a "four-star thriller."

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E. E.'s ON TOUR

An impatient group of Electrical Engineering seniors finally left Champaign a half-hour late on the first lap of their long-awaited Inspection Trip. The three hours were passed in sleeping and talking, with the exception of a few card games, one of which Al Zmeskal broke up by his disgusting habit of turning up eight or twelve Aces in every hand of a certain pinochle game. Professor Brown was seen looking furtively about, as though contemplating the possibility of installing a short-wave transmitter in place of the lavatory at the end of the car.

All were up bright and early Thursday morning—well, early anyway,—and over to the G. E. X-ray Corporation to view the manufacture and testing of various X-ray units. Here we were treated to a view of breakfast foods, candy bars, and baby foods as they passed over an X-ray beam, enabling the startled onlookers to see such peculiar ingredients as nails, buttons, and glass in supposedly pure products. After the tour of the plant we had an illustrated lecture on the applications of X-rays to the fields of medicine and engineering. This proved very interesting, but not enough so to keep Mehren, Carson, and Hull from nodding in synchronism, so to speak.

Then by bus to the Franklin Building of the Illinois Bell Telephone Company where we saw some motion pictures on the manufacture of cable and history of the telephone. Then an eminently satisfactory luncheon, with millions of beautiful operators in the Company cafeteria, and the remainder of the afternoon was spent in a tour of the building. This included the long lines department, repeaters, automatic dial systems, broadcast department, telegraph and teletypewriters and the power plant. We were fortunate enough when viewing the teletypewriters to get some encouraging stock reports and also a juicy item concerning the mysterious dive of a wealthy bachelor from a fifth story window. Mr. Skroder attributed his fall to nervousness.

Then over to the Lighting Institute for an interesting lecture and display, and also a marvelous view the loop from the 36 floor of the Civic Opera Building. We thought our hardest day was over, but little did we know—.

Early Friday morning a so-called non-sway ride on the North Shore to Milwaukee and thence by Toonerville Trolly to the Harnischpfeger plant, the home of gigantic excavators and cranes. After spending the morning viewing interesting manufacturing operations, we viewed also a very interesting luncheon provided by the corporation, with Brown, Mauch, and Williams feeding their tapeworms on seconds of luscious apple pie.

The afternoon found us at the Allis-

(Continued on Page 20)

FOLLOWING THE PROFESSION

Thiokol

The demand for a material to replace rubber has led to the development of Thiokol by the United States Army Air Corps.

Thiokol, a product of synthesis, differs greatly in chemical composition from crude rubber, but its processing is similar to that of rubber. It can, however, be carried out at reduced costs because of Thiokol's controlled chemical composition. Thiokol shows practically no chemical decomposition or deterioration over long periods of time. The fact that unprocessed Thiokol costs fifty-five cents a pound, while crude rubber is only fifteen cents a pound has not prevented the widespread use of Thiokol.

The major property that so recommends Thiokol is its resistance to corrosion by oil, gasoline, chemicals, and oxidizing agents. Its major use is in the aviation industry, having been adopted by the United States government and by many airlines. The present government specifications for the inner tubing of airport fuel hose require that it be made of 1000 parts of Thiokol and 80 parts of compounding material. The old type rubber tubing was rotted away by the gasoline, but Thiokol is not, and the danger of a plugged fuel line is less imminent.

Thiokol has been made to retain its shape at 250 degrees F., a temperature at which other plastics become soft. This makes it possible to use Thiokol in airplane motor construction in place of metal tubing which often rusts. Since Thiokol is not affected by any of the liquids used in the cooling system of motors, it is now used in place of the old rubber tubing.

The Department of Commerce has recommended the use of Thiokol in the relining of gasoline tanks and suggests its use in the original construction of such tanks. The British government makes the same recommendations. They claim that its use reduces the fire hazard in case of a crash. Tests have been made on tanks lined with Thiokol by dropping it from a height of fourteen and one-half feet. The tank did not break, and the only leak was at a cemented joint.

The Navy is experimenting with it in lighter-than-air ships, and is finding it very useful.

Thiokol is also being used to waterproof the outside of planes, and to seal the cabins for more effective air conditioning.

Today, wherever there is use for a light, waterproof substance that is uncorrodible, and which can be used for sealing joints, Thiokol is adopted.

Courtesy Aero Digest

Raw Thiokol Ready for Manufacture

Courtesy Electrical Engineering

Illuminated Plaque at the Texas Centennial Exposition

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Aesthetic Engineering

The success of such an exposition as that now being held at Dallas, Texas, is highly dependent upon electricity for illumination, power, sound equipment, and communication systems. The illumination of this great fair of the South is especially interesting, for every known device is used to make the lighting attractive. A characteristic of this exposition is the absence of windows in the buildings, thus necessitating the use of artificial lighting. Since expositions are primarily show places, and since shows are made more effective by proper illumination, artificial lighting was developed to its best.

All buildings are illuminated nightly, both outside and inside, floodlights being used almost exclusively in outside lighting. It has been found by experience that the use of floodlights tends to reverse the shadows of certain types of architecture, and for that reason special care was taken in designing the buildings of the Dallas Exposition so that reversed shadows would be eliminated. By concealing all of the floodlights, interesting lighting effects are produced.

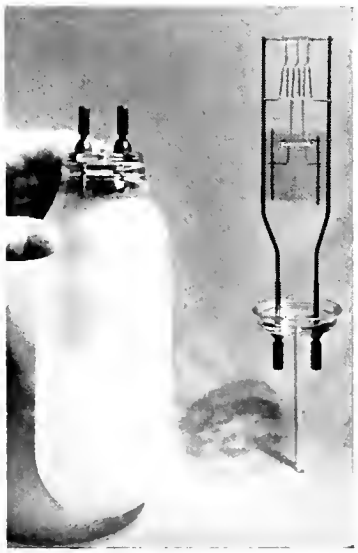
A tower, 175 feet high, located at the entrance to the Federal Building, is illuminated by white light which it

reflects in such a manner that the tower is visible for many miles.

Many of the main exhibit buildings have colored base reliefs near the entrances. These reliefs are illuminated nightly. The murals stand out prominently at night, because they are properly lighted. Much care was exercised in the selection of the paint pigments used in these murals, because it was necessary that they should retain the same color under artificial illumination that they had in natural light.

An Incandescent Screen Grid Lamp

The new improved 1000-watt Mazda lamp can be easily mistaken for a new type of radio tube. Lamp blackening, a factor influencing inefficiency, has been minimized with a newly-perfected screen. The lamp is constructed so that the filament sublimates during burning. The tungsten metal vapor rises with the heat and condenses on the surface



Courtesy Electric Journal

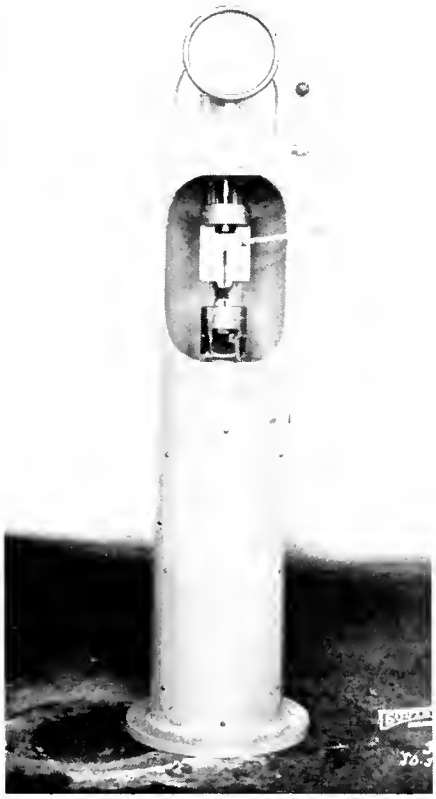
Incandescent Lamp

of the wire mesh. The lamp, because of its new bi-post construction and use of Pyrex glass, is about one-half the size of regular 1000-watt lamp. The lamp is always mounted base upward.

Afloat on the Filth of the City

Twelve years ago the city of Los Angeles built a large six-mile sewer. It is ten and a half feet high and twelve inches thick, lined with vitrified clay, and has narrow contraction and expansion joints of Portland cement. Recently, after heavy rains, large wet areas appeared directly above certain parts of this sewer. Upon sinking several test pits to the sewer, it was found that these wet areas occurred only where the cement joints of the sewer had cracked. The city could easily fix these cracks by putting a heavy layer of concrete over them, but they decided to find out to what extent the sewer system had suffered from earthquakes and the effects of gases.

The inspection trip was made by one of the city engineer's staff, in a non-sinkable boat, built especially for the purpose. The trips, usually a thousand feet in length, were made in the early morning, before the sewage stream had time to rise very high. One exceptional trip, a half mile long, was necessary where the sewer passed through a hill. The boat was controlled by means of cables and winches passing through holes that had been cut through the top of the sewer at every thousand feet. These openings provided some ventilation, but it was still necessary to use a forced draft. However, such quantities of hydrogen sulfide, gasoline vapors, and other poisonous gases were found, that it was necessary for the inspector to wear an oxygen helmet most of the time. Earth induction telephones were used to keep the inspector in constant touch with his shore control. Every precaution was taken to avoid ignition of the explosive gases in the sewer. As an added precaution, the boat carried a radio telephone as well as the ground phone. A strong electric search light furnished illumination for taking photos and for the routine inspection.

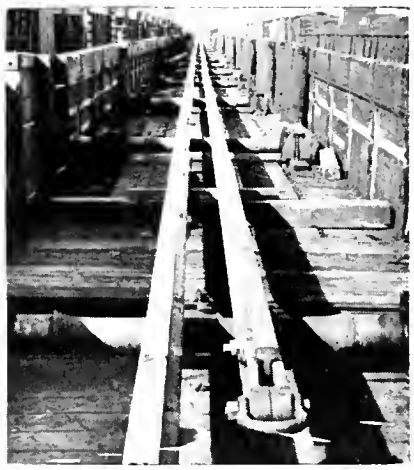


Courtesy Welding Engineer

Weld Testing Machine

4,000 Feet of Rail

The longest rail ever laid in one piece on any railroad system, was placed in the Blossberg tunnel through the Rockies, just east of Helena, Mont. It was four thousand feet in length. In order to facilitate unloading, the rails were welded together on rollers and extended a distance of ninety gondola cars. Unloading was accomplished by parting the train in the middle and pulling out half the cars at a time, thus permitting the rail to settle onto the road bed.



Courtesy Scientific American

The Longest Rail

Inspection and Testing of Welds

The art of welding has progressed only as fast as the methods of testing welds have been developed. Several of the more commonly used tests are unique, because the characteristics of a weld are quite different from those of a solid piece of metal.

The tests used in the inspection of welding are of two types: the destructive and non-destructive. The destructive tests give more complete information, but, of course, cannot be used in most commercial work. The destructive test most used is the tensile strength test, in which, if the weld is good, the metal often gives way before the weld. To determine the brittleness of a welded joint, a bend test is used. Variations of this test reveal how much the welding operation affected the base metal, and also, how well the two pieces have been fused together.

The non-destructive tests, used mostly in commerce, are very different from those just discussed. The specific gravity of a joint is often determined, and thus porosity, or freedom from it, is detected. The doctor's stethoscope is often used in the investigation of welds, for different properties of a weld can be determined by its sound transmission. Electrical resistance tests and magnetic tests have been used successfully. Vessels, such as steam boilers and storage tanks, are often tested by hydrostatic methods.

Seniors Inspect—

(Continued from Page 17)

Chalmers plant, where we saw manufacture of large turbines, generators, hoists, flywheels, and similar machinery. We also saw the winding of field and armature coils and testing and assembling of large electrical machinery. A rumor was being circulated that the Company operated its own power plant, but this was not verified, apparently much to the relief of some of the guides.

Supper in Milwaukee with the delegates to the Teachers' Convention and then back on the North Shore Line. Carson wanted to date up the blonde hostess at the Triangle restaurant (no advertisement), but Milner (Oh! You Puritan) finally managed to tear him away to the train.

At Waukegan an automatic mercury-arc rectifier sub-station was fruitfully visited and at Glencoe, after some delay because of the appearance of Link and Williams in another train containing charming female inspectors of sodium vapor lighting, a rotary converter type sub-station was inspected by an almost awe-stricken group who were beginning to realize how much they didn't know about electrical engineering.

Saturday morning to the Crawford Avenue power plant, one of the world's largest, where the first thing that caught our eyes was a mountain of 360,000 tons of coal. What a treat for the eyes of Van Slyck and Campbell! Brown and J. M. Miller started to calculate the calorific value of the fuel, but we had to go inside to view 425,000 KVa in the process of generation by 11,000 volt alternators, and positively gigantic high-speed turbines. We viewed the control gallery, from where the entire station was controlled, all readings taken, and frequency kept constant.

Back to the hotel in the buses, and then Chicago was ours. It is suspected that many of our engineers did a little inspecting on various non-technical projects along State, Clark, Van Buren, and Michigan streets. On the whole, the trip was well worth the time and expense involved, as it gave many of us our first view of large manufacturing plants and methods, and provided a very necessary link between theory and practice.

Professors Reid, Keener, and Brown, and Mr. Skroder, deserve our vote of thanks for their tolerant and helpful attitudes.

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C. E.'s HIT THE TRAIL

Four o'clock, Wednesday afternoon, November 4: senior civils arriving from all directions and carrying an assemblage of luggage that would do an ocean voyage, clamored around the buses at Engineering Hall trying to produce insurance policies and ticket receipts with both hands occupied. The two coaches left on time (as Professor Shedd warned they would). The first stop was for dinner at Decatur.

The ride to Decatur involved a lengthy discussion between Muhlenbruch, Slaymaker, and Brierton as to the best route to St. Louis. Muhlenbruch won (he sat next to the driver and talked loudest), and it is claimed that we took the longest and roughest road. Eats put the boys in a singing mood, and when all the songs that engineers sing were exhausted—sleep.

By some chance the ride ended in front of the Mark Twain Hotel. Everyone went up to bed (and most came back down again, dressed in evening clothes). When Skinner came in for sleep, he left "call at 6:15" with the desk clerk, but Professor Shedd had left "call all at 5:45."

Thursday, at seven, we "embused" for U. S. Dam, No. 25, built for navigation purposes across the Mississippi, to inspect the partially completed lock and gates. Vibrated concrete was being poured in a portion of the lock wall from five-yard buckets. At the mixing plants all aggregate is heated by live steam to produce concrete at a temperature of 70 degrees from two mixers.

At noon the group was in St. Charles eating an excellent lunch as guests of the Wabash Railroad, after which we walked across the one and one-half miles of truss and viaduct. The going was slow, having no hand rails along the single track with the river in view

100 feet below through the ties, and the end span was welcome to many. The ride back to St. Louis included stops at several Wabash Railroad grade crossings.

In the evening Mr. L. A. Pettus, Division Engineer, City of St. Louis, described the city plan and the new express highway. Surrounding the downtown section are large lighted areas, and the aim of the city plan is to demolish sections of this area and erect modern civic buildings, and thus encourage private individuals, who might hesitate to be the first, to do likewise.

The express highway is a five-lane pavement extending from the city limits, and eventually, to the municipal bridge. Grade separations are used at all intersections, and the roadway is illuminated by means of sodium-vapor lamps. A five foot protection fence parallels each side of the street, making it impossible for pedestrians to cross, except at the pedestrian overpasses provided.

Friday morning was spent inspecting the city plan work. Points of interest were the Municipal Auditorium (in which we heard part of a rehearsal of the St. Louis Symphony Orchestra), Court House, and Soldiers' Memorial (now under construction). The boys had great sport sliding on the ice rink while viewing the Lamella roof of the Arena, a light-weight wood construction of unusual design developed in Germany.

The afternoon saw us at the Mississippi Valley Structural Steel Company, where two large steel girders were being fabricated, and at the Scullen Steel Company, where old rails were being converted into concrete reinforcing bars, a fascinating sight to watch as the glowing hot rods were snaked from roll to roll and drawn down.

Saturday meant leaving for home, via Springfield, where we spent the morning going through the new water purification plant and looking over the dam that creates Lake Springfield for a water supply and recreational purposes. The plant contains the most modern equipment obtainable, and is calibrated in metric units so that readings can readily be compared with laboratory work.

The disposal plant reeks with efficiency. The sewage gases, including all odors, are collected and used to run two 150 horsepower internal combustion engines. The engine exhaust is used to heat water, which together with the cooling water, is circulated through the sludge tanks to hasten digestion of the material. From the total heat content of the gas, approximately 80 per cent is utilized. As we left the plant, Professor Babbitt tossed up dried sludge for olfactory inspection; despite any absence of odor, the boys were reluctant to touch it.

Our faculty members, Professors Shedd, Babbitt, Pickels, and Bauer, saw us safely back in Champaign.

ENGINEERING SMOKER A SUCCESS

SOME six hundred engineering students jammed Bradley Hall the evening of October 21, thereby, proving conclusively that the announced program provoked unusual interest. They were not disappointed.

John Parnell, president of the Engineering Council that had sponsored the affair, formally opened the meeting, and then introduced L. L. Smith, associate of Electrical Engineering, who, judging by the applause that his comments drew, proved a very capable master of ceremonies. Dean M. L. Enger, with his discussion concerning the cost of educating the engineering student; and Professor F. B. Seeley, speaking of the vitalness of engineering campus societies and the Technograph to the students' life, expressed the purpose of the meeting.

Captain A. C. Matthews, whose talks before student audiences have made him a favorite campus speaker, gave the boys, in his uniquely suave manner, an intimate picture of "The Architecture of Parisian Cafes."

After a short discussion of the necessity of greater student support for student activities, Robert Zaborowski commenced the eagerly anticipated slide-rule raffle. Maurice Harvey, a member of the Technograph staff, won the first drawing officiated by Dean Enger, himself. Very generously, Mr. Harvey offered the slide-rule for re-raffle to those who became subscribers to the Technograph that evening. Of some fifty new subscribers, D. C. Marston proved the luckiest.

The boys ended the meeting by capably reducing to nought, twelve hundred doughnuts, half a barrel of cider, and an uncounted number of cigarettes.

AN ENGINEER'S IDEAL

When one considers with what senseless and unconsidered repetition the whole idea of womanhood is being grossly misunderstood in our time, it would not be untimely for the engineer to consider in what higher relationship woman will influence his work when he is ready to leave school.

After the dates and the dances are done, after the four years are past, in what light does the engineer see woman? Let us assume that work should be his guiding passion. For, is it not through work that we achieve? There is so little time, there is so much to do! If the engineer considers his work in this light, the place of woman in the scheme of his existence takes on a higher meaning. In consequence, his place in the scheme of civilization will develop a larger meaning.

Man's primary reaction to woman is emotional. But, if an emotional reaction is not superseded by a higher spiritual solidity, the relationship between the sexes has not progressed beyond the brute stage. Even if the engineer is fired by that rare spirit of altruism that has made this world a finer place, he undoubtedly feels the need of something more immediate, something closer, to arouse in him the unfathomed powers that he possesses. Here the woman enters the picture. If a woman is a good housekeeper and begets children, is that enough? Is that a sufficient incentive to arouse a man's ideals and make them reality? I believe not. What sort of a woman, then, will help and inspire the engineer? Before going into that, let us consider the engineer's place in civilization.

Selfishness is to play a dominating role in our modern world. Selfishness is unknown to the Creator. Selfishness and personal gain did not build the San Francisco Bay Bridge. Unselfishness of attitude erected it. But, you will say, selfish people will travel it. The unscrupulous and the un-thinking will pass over it. Is the effort worth it? If the effort were in vain, what a mockery man's efforts would be? The engineer must be an idealist in a world of lost ideals. He must look to the future. He must think of the greatest good for the greatest number. He must be a dreamer amid the welter of commercialism.

The engineer, then, has his goal. Now he needs incentive. The right woman will provide it for him. She should be ambitious, not for personal glory, but for the success of her mate. This, according to present standards, is an admirable trait in woman. Too many women look to their men for moral and spiritual support. What they don't realize is that the men look to them for these same things. Failing to receive this support, marriage becomes a burden. The engineer should have as his mate a woman whose love of material things is never overshadowed by her love of the things of the mind and the heart. She must be a woman who knows the goal her mate is striving for, and keeps her eyes upon it without deviation. If she is that sort of a woman, people will pause before an edifice of stone and steel, mind and spirit, erected by her mate and say, "Look what man has achieved!" But over it will hover the spirit of a woman. An unknown woman, but who can say, perhaps she was the benefactress of humanity.

—M. R.

Professor E. E. Bauer of the Civil Engineering Department has recently been appointed a member of the Committee on Bituminous Waterproofing and Roofing Materials of the American Society of Testing Materials. He has also been made Assistant Chairman of the Committee on Foundation and Soil Mechanics of the Civil Engineering Division of the Society for the Promotion of Engineering Education. He attended the meeting of the First International Conference on Soil Mechanics and Foundation Engineering held June 22-26, 1936, at Cambridge, Mass. This meeting was sponsored by Harvard University as a part of its Tercentenary Celebration. While on leave of absence last semester, he was at Harvard University doing study in the field of Soil Mechanics and Foundation Engineering.

Professor E. E. Bauer was in Washington, D. C., November 17-20 to attend the 16th annual meeting of the Highway Research Board of the National Research Council.

When the 1940 Olympic games are held in Tokyo, Japan hopes to have television so advanced that Japanese homes will get television views of the events.

The Technograph staff wishes you a Merry Christmas and a Happy New Year . . .

SOUND PICTURES

(Continued from Page 8)

rent had to be made at the studio because the available alternating current fluctuated too much.

Sound not only added new difficulties to motion picture production, but it also added new men to the industry. Many new positions were created. Trained men had to be called in to operate the recording apparatus. The important and difficult job of monitor was created. The monitor listens to the sound, as it is produced, and he adjusts the controls until it sounds best. If several microphones are used on the set, he can vary the volume of the sound that each picks up and thus produce different effects in the recording. Sound cutters, musical directors, and song writers were all added to the staffs of the studios.

Sound recording and reproduction have improved a great deal since the first shorts. The older microphones, carbon and condenser, have been greatly improved. New microphones, such as the velocity and the crystal types, have been created. Reflectors are used to catch faint sounds. Much better amplifiers and mixing panels have been constructed. In fact it has been said that the radio follows the movies in the perfection of sound apparatus. Alternating current apparatus has taken the place of much of the direct current apparatus, thus cutting the cost of production. New and better films have been discovered and better printing processes developed, so that now, the photographic sound track is almost perfect. Methods of splicing the film have beeen so improved that there is no audible click as the splice passes the scanning slit. The art of placing the microphones, so that the greatest efficiency in picking up the noise results, has been perfected. When colored pictures first made their appearance, the color affected the sound, but a solution of that problem has now been made.

Marked improvements have also been made in the theater apparatus for the reproduction of sound. New photoelectric cells are more sensitive. The hard of hearing have been aided by placing headsets for them at the seats. The outstanding improvement is in the quality of the amplifiers and speakers. The modern speaker, placed behind the screen, reproduces the very highest and the very lowest of tones. The average efficiency of the theater equipment, however, has shown a tendency to lag behind that of the recording apparatus. In the past two years, most theaters of the country have brought their equipment to date, and there can be very little complaint about the quality of reproduction in nearly all theaters.

Some far-seeing man has said that animation, sound, color, and depth, or three dimensional animation, would be the four great developments of the motion picture. When one goes to the movies now, he can find very few imperfections in the animation and sound. Color is already growing out of its infancy. There remains only the giving of depth to the motion picture.

—M. K. C.

L. A. Pfaff, a graduate of the class of '33 in Civil Engineering, returned to the campus for the U. S. C. football game. Mr. Pfaff is chief chemist of the Rubberoid Company of Joliet, Ill., and, mixing business with pleasure, he consulted Prof. Bauer of the Civil Engineering Department on the layout of a new laboratory for his company.

M. T. L. may soon blossom forth as a University of Illinois Monte Carlo if a certain C. E., 35 class, continues its activities. To while away the time between the testing of concrete cylinders, a pool was organized to handle bets on the breaking points of the specimens. Everyone enjoyed the game, and the only thing wrong was that the charter members ended up in the hole.

Zinc can now be deposited over steel or iron to protect it with a surface that is brilliant, rather than the well-known dull color of ordinary galvanizing.

Green glass blackboards are now being made, with the claim that they eliminate glare and lesson eye strain.

It is reported from Germany that road tests show that certain artificial rubber tires are capable of giving double the road performance of tires made from natural rubber.

Old lady: "I wouldn't cry like that, my little man."

Boy: "Cry as you damn please, this is my way."

* * *

He: "I suppose you dance?"

She: "Oh, yes, I love to."

He: "Great! That's better than dancing."

* * *

Teacher: "Jimmie, can you tell me how matches are made?"

Jimmie: "No ma'am, but I don't blame you for asking."

Teacher: "What do you mean?"

Jimmie: "Well, my mother says you have been trying to make one for twenty years."

* * *

Doctor: "You must avoid all forms of excitement."

R. U. A. Purl: "Gee, Doc, can't I even look at them on the street?"

* * *

Huddy Reid: "It says here that a replica of a Voltaic Pile has been built which will keep a bell ringing continually for years. Why couldn't it be used on a door bell and save money spent on batteries?"

Paul Kaar: "It would be ringing all the time and you wouldn't know when somebody wasn't there."

TECKNOKRAKS

Bill: "The girl I am married to has a twin sister."

Mac: "Gee! How do you tell them apart?"

Bill: "I don't try. It's up to the other one to look out for herself."

* * *

Vera: "What color dress will you wear to the ball?"

Edna: "We're supposed to wear something to match our boy friend's hair, so I'll wear black. What will you wear?"

Vera: "I don't think I'll go. My boy friend's bald."

* * *

A man can be tied for life and still have someone else on the string.

* * *

Krivo: "You shouldn't pound your head against the floor. Do you want to injure it?"

Berman: "Don't be silly! This floor is concrete!"

* * *

1936 VERSION

George Washington: "Father, I cannot tell a lie. I cut your sherry."

* * *

A well known farmer met his hired hand carrying a lighted lantern and asked him where he was going.

"A sparkin'," was the reply.

"When I was young," said the farmer, "I always went in the dark."

"Yes," replied the hired man, "and look what you got!"

* * *

During their stroll they passed a negress, and the little boy, very much interested, asked: "Daddy, why is she black?"

"That, my son, is nature," replied the father.

"Is she black all over?" asked the boy.

"Yes," said the father, "she is."

"You sure do know everything, don't you, Daddy?"

* * *

"Jackie, the stork has just brought you a brand new sister. Want to see her?"

"Nope, but you hold onto that stork, will you?"

* * *

Angry instructor: "You missed class yesterday, didn't you?"

Gale Jones: "No, sir, not in the least."

"Hurry up, wifey, dear, or we'll be late for the theatre."

"I'm just trying my reducing machine. I'll be ready in two hundred shakes."

* * *

"Hey, get out of here. That's my bathtub you've just used."

"I thought it had a familiar ring to it."

* * *

DID YOU KNOW

1. Mud, if thrown into a pitcher of water, will settle to the bottom, but you can't hasten the process by pushing it down with your hands?

2. The common, ordinary boarding-house bed-bug hasn't a very highly developed appreciation of music and can never be taught to play a piano?

3. King Louis XIV wore clothes that are now considered very old-fashioned?

4. The dodo bird is now extinct?

5. That this stuff is not the least bit humorous?

* * *

"What do you do with your old razor blades?" questioned Sam. And Sandy replied, "Try to shave with them."

* * *

"Darling, how would you like for me to dress for the dance tonight?" cooed the girl friend. And the boy friend whispered, "As quickly as possible."

* * *

Ragman: "Any old clothes? Any old clothes?"

Goeke: "No. Get away from here. This is a fraternity house."

Ragman: "Any old bottles?"

* * *

Doctor: "Pat, your wife's just presented you with quadruplets."

Pat: "Four cryin' out loud."

* * *

Retonde: "What do you do when you get tired of hearing a girl's empty chatter?"

Carr: "I give in and take her to a restaurant."

* * *

"Men," he cried, "there is an announcement I want to make. Last night my wife presented me with a son."

The men broke ranks, cheered, threw their hats in the air, and general pandemonium reigned for nearly five minutes. When order had been restored, the Colonel, pleased with the enthusiastic reception of his announcement and the congratulations, indicated that he had another announcement:

"Men and officers," he said, clearing his throat, "I thank you."

* * *

When you knock at the door and find hubby home, then, brother, sell something.

* * *

Ask a girl to talk . . . if she's talkative;
Ask a girl to walk . . . if she's walkative;
Ask a girl to dance . . . if it's permissible;
But never ASK to kiss her . . . if she's kissable.

THE ILLINOIS

TECHNOGRAPH

MEMBER OF E. C. M. A.

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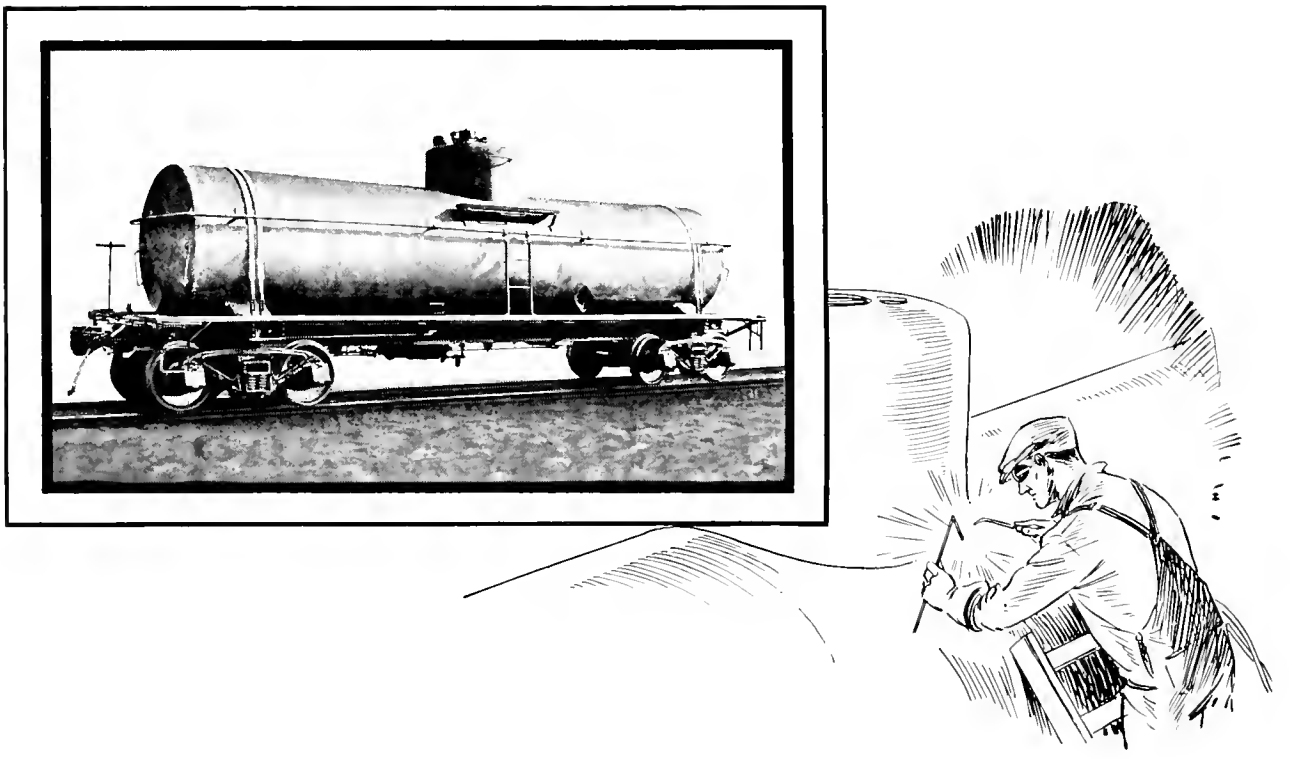

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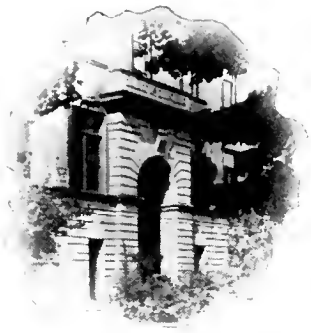

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

FEBRUARY, 1937

Volume 51 No. 3

PERHAPS those of you who take the time to read the Tecknokraks will notice that the page number is 32 instead of the usual 24. This is in line with the policy of the magazine to give the readers more for their money; only the finest cooperation of the whole staff has made this addition possible.

● The buildings of the future will be dominated by glass . . ." states Julius Horelick in his story, "A Galaxy of Glass," which may be found on page 10. It is a good article on which to relax and become "educated" at the same time.

● Harry Atkinson gets most eloquent about the many jobs just waiting for the sanitary engineers to take them in his article, "Overlooked Opportunities."

● If you're feeling ill, run down, or just plain "lousy"—turn to page 11 for information on how to obtain "Health from High Frequency" by Herb McSkimin.

● "Radiography in Industry," by Maurice Harvey, is an article which was inspired by a talk given before the Student Branch of the American Ceramic Society by Dr. G. L. Clark of the Chemistry department.

Contents

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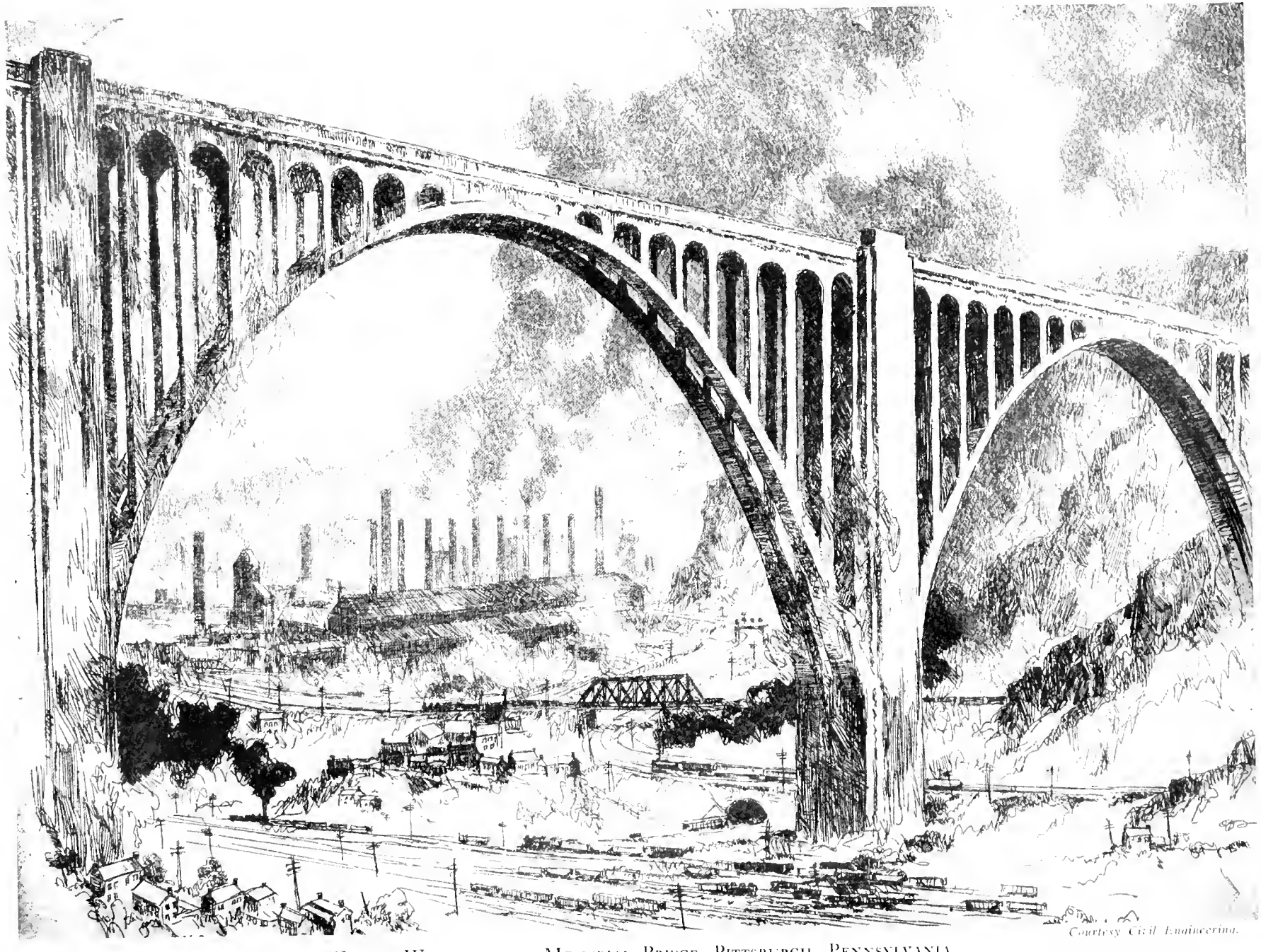


Courtesy Civil Engineering.

GEORGE WESTINGHOUSE MEMORIAL BRIDGE, PITTSBURGH, PENNSYLVANIA

From an Original Etching by Otto Kuhler

THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume LI FEBRUARY, 1937 Number 3

Just Around The Corner

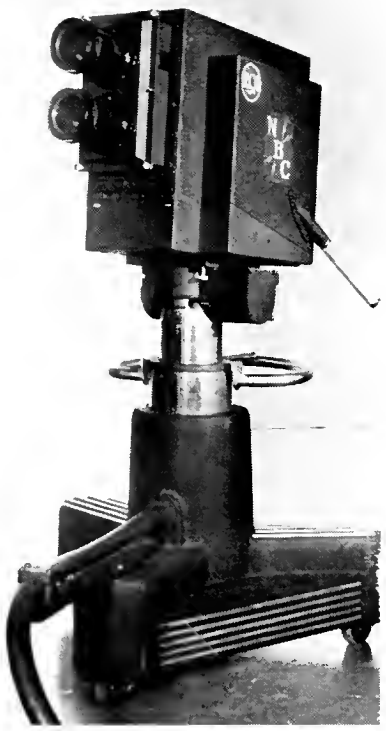
Problems Confronting Television Nearing Solution

WITH the assurance of television in the home by 1937, it is of importance for the person having an engineering trend of mind to become acquainted with the general aspects, at least, of picture transmission. Not only will he be able to discuss the subject with intelligence, but he will also possess that inner satisfaction that comes from knowing the various "how's and why's" that pertain to it. It is hoped that the following article will in some measure remove the mysteries from an engineering development which has all too long been "just around the corner."

The paradox of moving pictures may be said to be possible for one good reason, because the human eye tends to retain an image some little time after the light rays forming it have been removed from the retina. This inertia effect is so pronounced that an image will persist for over one-sixteenth of a second. This retentivity is made good use of in television.

Scanning is a fundamental operation of great importance. If a small spot of light is made to completely traverse an object in a definite manner, this object is said to be scanned. It is easily seen that the intensity of the light reflected from the object will vary according to the physical surface, shades, and colors of the object. If, then, this reflected light is allowed to fall on some device that will respond to the different intensities, and thereby control a certain transmission circuit, we have in effect a television transmitter. In one of the more simple systems, a disc having holes punched in a spiral progression is used for the scanning. A strong lamp is placed behind the disc, which is rotated with a constant angular velocity, and the light, in passing through one hole at a time, is reduced to a small beam which traverses the object completely, once for every revolution of the scanning disc. The reflected light is allowed to fall on several sensitive photo-electric cells which produce an electric current in proportion to the intensity of light striking sensitive elements. This variation of current is amplified by means of vacuum tube circuits, and made to vary or modulate the continuous wave sent out by an ordinary radio transmitter. The similarity between this type of transmission and radio speech transmission is apparent, for in the case of the latter, the radiated wave is merely modulated in accordance with sound variations acting on a suitable microphone, instead of light variations acting on a "light microphone," the photo-electric cell.

In order to reconstruct the image at the receiving end, it is necessary to go through the inverse of the operations performed at the sending end. The modulated wave is picked up by means of an ordinary radio receiver tuned to the frequency of the incoming wave.



—Courtesy R. C. A.

Television Camera

Detection takes place in the ordinary manner, an electric current being produced which varies in accordance with the light reflected from the object at the transmitting end. This current is made to operate a neon lamp (or to modulate a light beam produced by an ordinary incandescent lamp) which responds almost instantly to the varying current. If this light, changing in intensity all the time, is made to pass through the receiving and scanning disc, the object will appear reconstructed to a person looking towards the neon bulb through the rotating disc. In order for the image to appear complete at all times, the object must be completely traversed at least sixteen times a second so that the natural retentivity of the eye will make it appear as though all parts of the object had been illuminated at once. Furthermore, the receiving end scanner must be of similar construction to the sending end scanner and must rotate at the same speed.

The following, then, are fundamental to a television system:

1. Scanning of the object.
2. Production of an electric current which varies in accordance with the reflected variations.
3. A transmission system.
4. A receiver.
5. A device for producing light variations in accordance with the receiving end currents.
6. A synchronous scanning system at the receiving end for reconstruction of the image.

There are other television systems which have proved successful. The names of Baird, Jenkins, Farnsworth, and others, stand associated with them. Fundamentally, however, the systems are quite similar. It might be pointed out that the mechanical scanner can effectively be replaced by a cathode type, the spot on the fluorescent screen tracing out the image. The advantage of this type is apparent, for the pencil of electrons comprising the cathode ray may be easily and instantaneously controlled, thus making possible a high definition image. The two factors, position of spot and intensity, remain important. Obviously the matter of synchronization must be worked out. In regard to the intensity of the spot, a grid is placed in the cathode ray tube, the potential on this grid being controlled by the output of the receiver amplifier. The traversing of the spot is accomplished by means of electrostatic deflation plates or magnetic deflection coils. The frequency of the carrier wave received can be made to effect perfect synchronization.

Since the photo-electric cell plays an important part in television, it might not be out of place to discuss them. When light strikes most substances, especially metals like potassium, rubidium, and cesium, many electrons are given off. It is interesting to note that this effect, the photo-electric effect, was responsible, in a great measure, for the adoption of the corpuscular theory of radiation. If a metal plate is made of these light sensitive substances and placed inside a glass tube from which the air has been exhausted, and if another plate is also put inside the

(Continued on Page 6)

Geophysical Exploration

UNTIL recently, man's knowledge of the earth beneath him has been very limited. He could study the stars and planets and discover their physical laws, but his science was able to evolve no laws governing the successful penetration of the earth's crust. Only through mines, caverns, and special drillings could he determine the composition of the earth. These methods barely scratch the surface of the earth's great mass of material.

Geophysics is the science which is aiding man in solving many mysteries of the interior of the earth. The science itself is rather young, although the principles involved are similar to those which have been used in studying other physical bodies. Geophysics is fundamentally based upon man's knowledge of the mechanics and properties of physical bodies. The progression from the earth's surface into the crust is scientifically accomplished by one of these four methods: (1) gravitational, (2) magnetic, (3) seismic, (4) electrical.

The gravitational method uses the natural gravitational field of the earth. It is a known fact that the earth's pull on bodies varies with the density of the particular material. The denser the body, the greater will be the force. If a body of ore is surrounded by a material of different density, its effect upon the period of a pendulum or Eotvos torsion balance can be noticed. This work is highly sensitive, and it requires a great deal of time to make the measurements. For this reason its field of use is limited.

Magnetic Method

The magnetic method is the oldest application of physics to sub-surface exploration. The principle involved concerns the effect of a magnetic field upon the needle of a compass. The earth's magnetic field will cause a torque to act upon a freely swinging compass needle. If a magnetic body is producing a field, the needle is affected. It is known that the magnetic dip of the needle varies over different parts of the earth. These variations have been found very accurately by the United State Geological Survey and other such organizations. Any deviation from this known value obviously indicates some unknown force. By this method, the ore bodies which have a magnetic field can be discovered. This process is useful in prospecting in magnetic iron fields. It is of interest to note that placer gold deposits have been found in this way, since gold is usually associated with magnetite.

The seismic method is receiving most interest in the commercial field. The general procedure is to explode a charge of dynamite near the surface being explored. The compression waves travel down until they hit a reflecting layer which sends the waves toward the surface where they are picked up by detectors that convert this mechanical energy into electrical impulses. These impulses are amplified and recorded on a moving strip of photographic paper. On this same strip of paper, the waves caused by the dynamite are recorded around a cylinder which is timed to a hundredth of a second. By determining the time necessary for the reflecting wave to travel through the earth, the depth of the reflecting layer can be found.

Used for Oil Discovery

The oil industry has used this method of exploration considerably in the last few years. The East Texas oil fields are at present being actively explored. The oil of this region is in a reservoir of salt domes. These salt domes act as the reflective layer in the seismic method. Since oil is so often found connected with these salt domes, the procedure is to explore for the salt domes in hopes that they contain oil. In this way all guessing has been eliminated, thus giving the oil industry more security.

The electrical method of geophysical prospecting is one which is being used more and more. New and portable instruments are being developed. Some ore bodies, particularly sulphides, undergo oxidation and cause a difference of potential in the body. This will cause a current to flow tending to neutralize the potential gradient. The current spreads through the ground for quite a distance. By tracing this current, the body can be found. Unfortunately, this method is limited to special types of deposits.

Other Applications

Geophysical exploration is not applied to the mining and petroleum industries alone. The civil engineer is using it to a great extent in locating foundations for dam sites, in river work, and in tunneling. One can readily see the economy of this type of exploration compared with the costliness of drilling test holes. The results, too, are much more gratifying.

The future of geophysics is promising. The methods now employed are fundamental, but improvement is necessary. Since the mineral wealth of our country is being rapidly consumed, and since the chances for finding deposits are lessening, the hope for the future depends upon careful and scientific exploration of the earth's crust.

—M. R.

(Continued from Page 5)

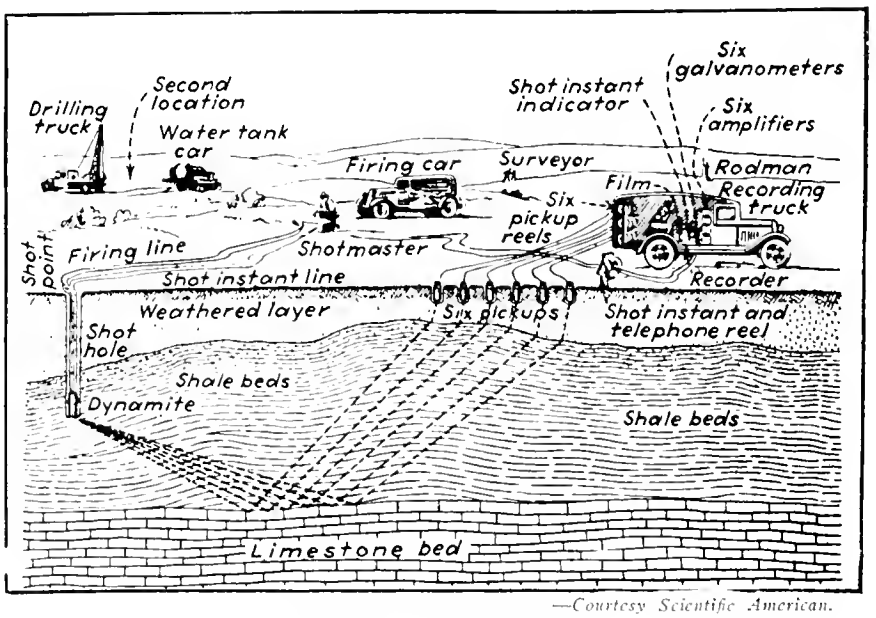
glass envelope, electrical connections being made to both plates, we have a usable photo-cell.

If the sensitive element is connected to the negative terminal of a battery and the other electrode is connected to the positive terminal, a current will flow when light strikes the cell, the emitted electrons being attracted to the positive plate. The output from a photo-cell, being used for television is always put into a vacuum tube amplifier so that enough power can be obtained to modulate the transmitted wave.

A few words might be said regarding both systems. Mechanical scanning, produces large white and black pictures with less definition than does the electronic scanning. On the other hand, a large cathode tube is expensive, especially if the price of the auxiliary amplifiers and power supply is included. Each system is fairly free from troubles in operation and repair, and each system has commercial representation.

Television on a commercial basis is assured us (if we are to believe such men as David Sarnoff, president of R. C. A., and Philo Farnsworth). It is the writer's opinion that at best, only a few programs will be presented, the variety being limited to the few channels available. Since the modulation frequencies are quite high, the side bands of a transmitted wave will necessarily be large. For best reproduction, frequencies above the audible range will be needed. The width of the channel required for transmission might be five or even twenty times that required for the transmission of sound. Except in the very high frequency spectrum, there would be room for only a limited number of stations. From this discussion, it would seem that the use of short waves is imperative. Only time will tell the entire story.

—H. McS., W9DPD.



—*Courtesy Scientific American.*

Seismic Field Apparatus

Saint • Pat's • Ball •

THE CORRIDORS of Engineering Hall are quieting down after intense reverberations from the strains of "I'm In a Dancing Mood." This ditty, with original arrangements and unique variations, issued forth from a pair of lusty lungs belonging to one of our mighty engineers—"just to give a little atmosphere for the occasion," he says.

The occasion? We wonder, but not for long, because this song murdering troubadour from Chambana is a member of that august body of gentlemen (?) — the Engineering Council, better known as "The Voice of the Engineers" —whose foremost problems are centered, at present, around the completion of the final plans for the annual social splurge of the engineers — St. Pat's Ball. (That is, they are taking care of making the arrangements for the dance itself, but you—my fine, feathered friend—must be responsible for the "home work").

WHO'S WHO

W. D. Orr, a former E. E. and now a law student and the Illinois Union representative on the council, has taken over the gavel of presidency since J. G. Parnell, we regret to announce, was compelled to resign by order of Dr. A. Illness. The new prexy is very ably taking over the fine beginning made by his predecessor and is carrying on to complete the final plans for a St. Pat's Ball which will be the ball of balls. In plain words, this affair will surpass by a wide margin any other engineering fete ever attempted heretofore.

Professors Crandell and Doland are the persons who have willingly volunteered their services and advice for the good of the council. The credit for the work and accomplishments of this organization for the year should go to the men who compose the group. E. C. Adams is the vice president and G. H. Logan watches out for the social and financial obligations with the office of secretary-treasurer. The other members on the council are F. Andrews, H. A. Hashbarger, F. Hummel, R. J. Kirsten, E. G. Robbins, R. Zaborowski and E. L. Cornell.

SOMETHING GOOD

Just in case you are beginning to wonder what this boloney is all about —Listen, youse guys and you shall hear, of the night of nights for the Engineer; forget about wires, bridges, and all; remember naught but our own St. Pat's Ball. (Now, please, no cracks). With the provision that you bring a date (for the information of the backwoodsmen returning from a survey of South Campus), you are all invited to enjoy a night of dancing to the music of genial (I guess he is) Lang Thompson. Lang and his boys ran away with the contest last spring for the most popular band on campus. This fall he has been enjoying an extended engagement at St. Louis. The date for this evening of swinging, waltzing, and great hilarity has been set for Friday evening on March 12. Just tell the cab driver (unless you have a permit for your own cab) to let you out at the New Men's Gym and you'll be all set for the big time in store for you.

SOMETHING NEW

Now, here's where the big news comes in! This dance is going to be different—entirely different! It's going to feature for the first time in the history of University dances a real, honest-to-goodness floor show. Among the features will be a dancing and singing chorus from the pick of the sorority women. Of course solo numbers will be on the program as well. In addition, certain of the Union Minstrel Show performers will do their stuff for your exclusive entertainment. (If you want your own little pride and joy out on the floor to do her strut, be sure she goes up to the Park for the tryouts during the week-ends). Judging will be done by the students dancing in the said place—and you engineers surely ought to be able to find some real "ability girls." Especially the civils should do a good job since they make an especial study of curves—highway curves, of course!

Don't forget, also, to see that your favorite is elected at the next society meeting to be your candidate for wearing the crown of old Saint Patrick himself. Presentation of the crown will be made with appropriate ceremony at the dance.

SOMETHING FOR YOU

The big surprise of the evening will be the programs. They are entirely different from any ever befor distributed. They are something which you can keep and which will be more than "A swell dance, honey. Love, Clementine." They are really a permanent record of your fun. They are . . . whoa, I almost told, but that is for you to find out when you fork over the dough for that little piece of cardboard which is defined as a ticket!

ST. PAT'S FOR ALL

"Well, I'll be—! What in the—! Do I hear "Won't Dance?"—and after all my hard work trying to tell you mugs what a swell time you're going to have! Well, there's just one thing for a guy like that—into the Boneyard with him boys! No slackers in this crowd that stay dry! Stop! He's changing his mind, so put him down, fellows. We'll all meet at the gym at nine o'clock. So long, and don't forget."—H.G.

Faculty Men Receive High Awards

ON January 20, at the annual meeting of the American Society of Civil Engineers in New York City, two members of the faculty were honored with the presentation of medals. The J. James R. Croes Medal was presented to Wilbur M. Wilson, Research Professor of Structural Engineering. This medal is given annually by the society for the technical paper which is judged worthy of special commendation for its merit as a contribution to engineering service. Prof. Wilson's article was on some laboratory tests of multiple span arches which he supervised as part of an extended investigation being conducted at the Engineering Experiment Station. In 1934 this medal was presented to H. M. Westergaard, who was Professor of Theoretical and Applied Mechanics here until this year when he became a professor of civil engineering at Harvard.

The other award was the presentation of the John Fritz gold medal to Arthur Newell Talbot, Professor Emeritus of Municipal and Sanitary Engineering. This medal, which is the highest professional engineering award given in this country, is given yearly in recognition of notable discoveries in industry and science. Prof. Talbot was selected as the thirty-third recipient of this award by a board consisting of sixteen past presidents of the A. S. C. E., A. S. M. E., A. I. M. M. E., and A. I. E. E. Other notable persons who have received this award are Lord Kelvin Goethals, Orville Wright, Guglielmo Marconi, and Herbert Hoover. Professor Talbot has been very active on the campus here for the last half century in teaching and research work. He is noted for his pioneer research work in plain and reinforced concrete, research in railway track stresses, and investigations on structural parts. He has also done much work in the design and construction of waterworks, sewerage systems, brick pavements, and as consulting engineer on reinforced concrete building, bridges, and dam construction.

Overlooked Opportunities

LEAVE OPENINGS IN SANITATION

SANITARY ENGINEERING! The very words connote, in the minds of most people, offensive odors and slime. Those very words call forth a picture of sewers and the filth passing through them. But sanitary engineering, far from being restricted to the study and construction of these usually repugnant sewers, has, since its beginning with early water and sewer works, progressed far beyond the original fields until today it includes so many diversified activities that no one person can hope to become expert in all phases of the profession, no longer simply a branch of civil engineering.

First Course Here—1892

The sanitary engineering course, established here at the University of Illinois in 1892, was probably the first of its kind in an American college, Columbia university and Massachusetts Institute of Technology soon following with similar courses in 1896 and 1899. Former Professor Ira O. Baker, in an unpublished history of the College of Engineering, tells of its beginning:

> "In 1892 the Department of Municipal and Sanitary Engineering was instituted;—Professor Arthur N. Talbot—was placed in charge as Professor of Municipal and Sanitary Engineering. He had previously given instruction in municipal engineering subjects for civil engineering students, and it was believed that a formal curriculum primarily for training prospective city engineers would serve a public need and attract many students."

However, the course has never attracted a great many students. At first it was supposed that the lack of interest was due to the uncertainty of the tenure of office of city engineers, but today it is assumed to be a result of a general ignorance of the opportunities in the profession.

85 Graduates Per Year

In 1928, Mendelsohn of the United States Public Health Service made a survey of the sanitary engineering courses offered in American colleges. Of only 16 colleges offering courses in sanitary engineering, six offered a regular course and the other ten offered an option in the civil engineering course. The total number of graduates of all the sanitary engineering courses (1928) has never been greater than 85 per year. This figure has probably not been exceeded since 1928.

Until 1926 municipal and sanitary engineering courses at the University of Illinois were under a separate department, but in that year Professor A. N. Talbot retired from active teaching and Professor H. E. Babbitt became Professor of Sanitary Engineering, teaching the course as a senior option in civil engineering. Under this plan the students do not decide on their branch of specialization in civil engineering until the fourth year and the field of sanitary engineering is rather obscured behind the broad scope of civil engineering. Thus sanitary engineering receives little publicity and potential college students who might be interested know very little about the work. It is the object of what follows to point out some of the opportunities open to graduates of sanitary engineering courses.

Civils Attack Health Problems

Civil engineers have long been charged with the design and construction of water and sewage works, and it was a natural step, as the public health interest developed, to attempt to educate them to the relation of their work to the public health. As public health work became more complex, an increasing number of engineers entered the field to handle the technical details of the work. The number of water and sewage treatment plants continued to increase as well as to become more complicated in their operation, requiring trained operators; and in addition the engineers were drawn into governmental work to deal with problems of garbage and other waste disposal, milk and food supply, air supply, and dust and odor control.

The engineering work connected with the city, county, state, and federal public health services is largely advisory, regulatory and administrative; having to do with surveys, inspections and the establishment of minimum standards. The design, construction, and operation of the various plants falls within the field of the private and consulting sanitary engineer.

The Public Engineer

The term "public health engineer" has been adopted for the sanitary engineer in public service, dealing with all phases of sanitation. Professor Hyde of the University of California divides the problems of environmental control or sanitation as met by the public health engineer into ten classes or categories of activities as follows:

> "1. The quantitative and qualitative control of the air supply.
>
> "2. The quantitative, sanitary and esthetic control of the water supply.
>
> "3. The control of the milk supply; production, transportation, pasteurization, sale and handling.
>
> "4. The control of other food supplies; production, transportation, preservation, sale and handling of raw food products; canning; refrigeration.
>
> "5. The control of liquid wastes: sewage, trade or industrial wastes; sewers, drains and treatment plants; ultimate innocuous disposal.
>
> "6. The control of solid wastes: collection, transportation, treatment and disposal of municipal re-

Sewage Sludge Digestors and Gas Holder, Janesville, Wis.

Attractive Sewage Treatment Plant at Geneva, Ill.

Airplane View of Westerly Sewage Treatment Plant at Cleveland, O.

fuse, including garbage, rubbish, ashes, street sweepings, night soil, dead animals.

"7. The control of the animal and insect carriers of infection: rodents, dogs, goats, cattle, hogs, etc.; preventative and palliative measures against flies, mosquitoes, fleas, lice, ticks, etc.

"8. The provision of environmental cleanness: street cleansing; dust, soot and smoke control; swimming pool sanitation; street paving; camps and camp grounds.

"9. The provision of sanitary conditions in factories, shops, schools, churches, theaters, and houses.

"10. The control of nuisances and other unsatisfactory conditions including odors, obnoxious gases, excessive noise, and the like."

Of the above problems listed by Professor Hyde, those in classes 2, 5, and part of 6; namely, water supply, liquid waste disposal, and garbage and refuse disposal, are specifiely dealt with in Sanitary Engineering courses. However, nearly all of the activities require some engineering ability.

Present Opportunities

The college graduate of a sanitary engineering course may find employment in the fields of water and sewage treatment primarily with governmental units such as county and state health departments or municipal treatment plants. With health departments, the work consists principally of inspections and reports relating to recommendations or regulations. All state sanitary engineering departments necessarily maintain laboratories and the engineer needs a thorough knowledge of chemistry, biology and bacteriology. The operators of municipal treatment plants, large or small, must usually be prepared to make all chemical tests required and also be able to perform minor repairs to any and all machinery operating at the plant. This requires additional knowledge of fundamental electrical and mechanical engineering.

In the field of private practice, the mechanically minded designing engineer has great opportunity to develop new and different devices for use in treatment plants. Many sanitary engineers also hold highly paid executive positions with firms manufacturing such machinery.

Few cities, if any, design their own plants, preferring to let the contracts to private consulting engineers who have had wide and varied experience. With such firms of consulting sanitary engineers, the college graduate has the possibility of advancing from draughtsman to a prominent executive position.

The field of research is comparatively restricted to work in colleges or for governmental agencies, but some manufacturers maintain well-equipped laboratories and well-trained staffs to deal with almost any problem that may occur in connection with the use of their products.

With regard to the other activities on Professor Hyde's list: air supply, milk supply, food supply, disease carriers and general sanitation; some of these are at present among the work of the civil engineer, but in general the work is done by chemists, chemical engineers, mechanical engineers or merely appointed officers. Such men probably achieve a fair amount of success, but usually they lack a knowledge of the proper relation of their work to the public health. The graduate sanitary engineer has a wide field of opportunity in all these activities as well as in the work covered by the formal engineering course.

In the field of sanitary engineering today, there are few graduates of sanitary engineering courses. The greatest number of the engineers have drifted into the profession after receiving other training, but the scope of sanitary engineering is expanding so rapidly that other fields can not supply the necessary men and college trained sanitary engineers are in great demand. As Mendelsohn's survey indicated, too few students elect the present courses, and the field is far from crowded. The opportunities and the training exist—the men are to be found. —H. A.

Photographs Courtesy Pacific Flush Tank Co.

Airplane View of Sewage Treatment Plant at Durham, N. C.

To produce hydrogen needed for the trans-Atlantic zeppelin service, an electrolyzing plant is being built at Rio de Janeiro.

To keep a giant ocean liner free of rats used to cost about $50,000 a year, but now great ships can be built ratproof.

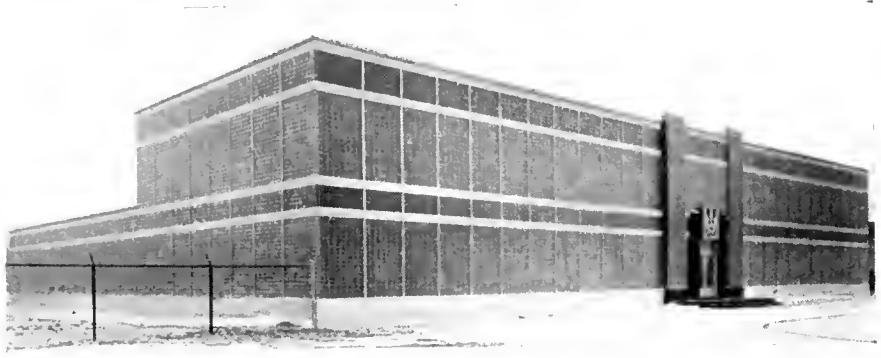
Chemists find that if dye is to give a fast color to cotton, the dye particles must be smaller than one seven-millionth of an inch in diameter.

Russians today are attempting to use silk and canvas soaked in a special solution instead of the usual photographic paper.

A GALAXY *of* GLASS . . .

New Products and Developments

GLASS will dominate living in the future. Cities will be constructed of glass, furniture will be of glass, light will be filtered and projected by special glass. Elevator shafts, bridges, stairs all will be of glass. With his imagination brimming over, one of today's great authors presents this picture of the future in his latest work. Glass will be King!



—Courtesy Ceramic Industry.

Laboratories of Owens-Illinois Glass Co. Built of Glass Brick. New Glass Products Get Their Start Here

While the glass industry of today has not yet achieved this idealistic stage, glass has reached into new markets in which its adoption has been enthusiastically acclaimed. New compositions, new and more reliable tests, savings through unique and improved designs, and innumerable other milestones in the development of this industry have been passed to make the record of the glass industry the most outstanding in the engineering world.

Glass Fibers

Prominent in the host of new products is fiber glass. This material is quite different from the product ordinarily known as glass wool. Glass fiber has for a number of years held the interest of ceramic engineers who were attempting to study physical properties of materials by use of fine fibers. Although known for twenty years, glass fiber is only now gaining commercial consideration.

The length of these glass fibers is limited only by the demand of the engineer, individual fibers having been made as long as 5,000 miles. In this respect glass fiber is similar to silk or rayon, since they are the only other commercial fibers that are not comparatively short. In addition it is interesting to note that these fibers have the extra-ordinary tensile strength of 250,000 pounds per square inch. In order to illustrate just how fine these glass fibers are drawn, picture to yourself an ordinary quart bottle. If a continuous fiber were drawn from this amount of glass, it would reach once around the world, or be about 25,000 miles long.

In handling glass fibers commercially, single strands are combined to give threads of the desired size. These fibers have been worked very successfully on standard textile looms where the material has been knitted, braided, and felted for different uses. The time is not far when you may expect to wear glass fiber sweaters and suits. Another promising commercial application for glass fibers is as a filtering material. At the present time cotton cloth is used for this purpose. In acid solution cotton cloth has a very short life, whereas, with the acid resistance of the glass, a much longer life results. Filters of glass fibers are made in two forms: a mat form, in which a felt of the glass fiber is impregnated with latex, and as a woven cloth.

Further application of the glass fiber has extended to the electrical world to be used as insulation for cables and wires where high temperature insulating materials are desirable. Glass fibers have recently become available for a multitude of new uses, which are assuming greater importance with each passing day.

New Safety Development

Very timely among recent developments in the glass industry is Poloroid glass. Poloroid may be described as a safety glass in which the polarizing element is in the plastic between the two sheets of clear plate glass. It transmits light almost as well as ordinary glass, but the intensity of the glare is reduced by one-half. This material finds its market in scientific instruments, photography, manufacture of non-glare glasses and goggles; but primarily in the automotive industry where it is being used for headlights. Coming as it does on the eve of "safe driving campaigns," and the fact that the major portion of all accidents occuring at night are due to glare from oncoming headlights, Poloroid is certain to become a permanent feature in all new car models.

Not to be outdone by other sections of the glass industry, the plate glass manufacturers have kept abreast of the times by introducing "invisible glass." This so-called "invisible glass," which only recently made its appearance in

(Continued on Following Page)

—Courtesy Ceramic Industry.

Office Interior Built of Glass Brick. Note Ceiling Insulated with Fiber Glass

The Possibility of

Health From High Frequency

HAS PASSED RESEARCH STAGE

THE benefits to be derived from the proper application of heat to sore and aching parts of the body has long been known. Today the sale of sundry heating pads and hot-water bottles will testify to the success of such treatment. People will go so far as to subject themselves to the discomforts of hot steam baths and scalding applications—all because of the curative properties of heat. Even nature, whose methods we are ever emulating and amplifying, provides a fever to combat disease and infection.

Uses of High Temperature

Raised temperatures can do several things. They may kill foreign or parasitic life; and for that matter, if uncontrolled, they may bring about unwanted injury to living tissues. There is also a decided effect on the solubilities of the different compounds which exist in the human body. This point is of importance and will be referred to again in connection with bursitis. The influence of high temperatures on chemical reactions should also be mentioned. It has been found that the speed with which chemical reactions take place is almost doubled for an increase of ten degrees Centigrade. Take for an example the cooking of food. A piece of meat will cook more quickly if its temperature is raised more than usual by means of a pressure cooker.

In the past the chief methods of applying heat to the body have called for a conductance of heat from the outer surface of the skin down into the tissues. In other words, the application has been entirely external. The whole art of diathermy has been based on this principle, but there are certain inherent disadvantages which are at once apparent. In order for the temperature of some deep-seated muscle or tissue to be raised appreciably, it is necessary that the temperature at the surface of the skin be dangerously high. The temperature gradient becomes quite steep. The body at all times tries to maintain a constant temperature which is a little less than ninety-nine degrees Fahrenheit. With the conduction method of therapy, the heat cannot be localized, and the necessarily high surface temperatures are dangerous. The action of the heart is greatly increased. Needless to say, the patient is extremely uncomfortable while being treated.

High Frequency Apparatus

Within the past decade or so, a new field has been opening, made possible by the development of high frequency alternating current apparatus. The older methods of diathermy are being rapidly supplanted as improvement of electrical technique takes place. However, let us first see why all of this is possible.

If a direct current is passed through a resistance, heat is given off, being proportional to the resistance and the square of the current. Hence if a direct current were made to pass through human tissue, heat would be developed. The trouble is that only a very small current can be tolerated by the body. Intense muscular reaction and even death result if the current is allowed to become too high; this way of producing heat for curative purposes would be impossible.

Muscular Reactions Minimized

An entirely different situation is found when we come to a study of the effects of alternating currents. With frequencies under 10,000 cycles per second, the same drawbacks listed for direct current apply. As the wave length is decreased, however, the muscular reaction decreases until, for frequencies above 10,000 or so, it is practically zero.

A great deal of independent work has been done concerning the use of alternating currents for healing. Experiments have been performed upon plants and animals, the work being done both in the United States and in Europe. George Lakhovsky in 1924 showed that tumors produced in plants by the innoculation of bacterium "tumefaciens" could be made to disappear by the use of high frequency alternating currents. His experiments on cancerous persons proved to be somewhat successful. Dr. Schereschefsky in the United States and Professor Esau and Dr. Schliephake of Germany noted that small animals such as mice could be killed by a continued and intense application of ultra short waves. Obviously, the heat developed was the cause of their death. Jacques d'Arsonval performed some interesting experiments by sticking two electrodes into a live rabbit's leg and observing that the muscle was heated by the passage of the alternating current.

Partial Success Excites Interest

The early apparatus used for the treatments of human bodies was of the condenser type. That is, two plate electrodes were placed so that with the diseased portion of the body as a dielectric, they formed a condenser through which high frequency alternating current was made to pass. Due to dielectric losses within the tissues and muscles, heat was generated.

Dr. Harry Eaton Stewart is probably the one man to whom credit should be given for showing the applicability of electric therapy to human needs. In 1921 Col. George B. Young of the U. S. Marine Hospital Number 21 on Staten Island called upon him to relieve the sufferings of the sailors inflicted with pneumonia. With rather elementary equipment, Dr. Stewart tried out his idea of applying heat to the sick lungs by means of his high frequency machine. One electrode was placed on the patient's chest and the other on his back. Almost immediately after the treatment began, breathing became easier and the pulse became more nearly normal. The electric heat widened the small blood vessels around the sick spots and allowed more and more phagocytes to enter the conflict, giving nature a much better chance to win out. This application of electric diathermy is extremely important when it is realized that there are nearly three times as many deaths due to pneumonia as to automobile accidents.

Since the body acts as a dielectric, as was mentioned before, the dielectric constant and also ionization are important factors. Due to the fact that all parts of the body do not have the same constants, selective heating may be accomplished. By choosing the correct frequency the heat may be more or less concentrated in certain layers.

Recent tests, however, have shown that there is a still better method of

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(Continued from Preceding Page)

America, may be the answer to the merchant's prayer as a means of displaying his wares in a new and startling manner. Objects when viewed through invisible glass have a realism that is impossible with straight plate glass. In addition it creates the illusion of a greatly enlarged display space. Invisible glass is made by using convex plates which do not reflect confronting images, making for perfect vision. There are special mirrors that transfer to hidden light absorbing areas all light that causes reflections. Thus a person when viewing the display is unconscious of the fact that there is a glass in front of him unless he should be tempted to touch the articles in view. Invisible glass is being given trials by leading merchants all over the country, and from the glowing reports that are coming in, it is probable that its universal adoption is a matter of a short time. One merchant who recently tested its merits, laughingly remarked that since people are unable to see their reflections in the glass, they will no longer use the window for fixing their hair or arranging their clothing, but actually view the articles on display.

Not entirely new, but greatly improved, is the heat resisting Pyrex glass now making its debut in the field formerly dominated by pots and pans. Pyrex is now manufactured so that it can be used directly over a gas flame or an electric plate. The new material is far more heat resistant than Pyrex Oven Ware and somewhat lighter in weight.

Glass marches on with new products, new methods, new contributions to civilization. Is it any wonder that men like H. G. Wells visualize the time when glass will be King! —J. H.

causing heat to be developed within the body. Instead of having plate electrodes, a magnetic field is produced and the diseased part placed in it. Since the field is alternating at the same rate as the magneto-motive force producing it, eddy currents are set up within the tissues as explained by Faraday's Law of Eelectromagnetic Induction, and heat is developed. It has been found that the best results are obtained by using a frequency of about 14,000,000 cycles per second. The rate of heat generation, as might be expected, is proportional to the electrical conductivity. This means that the method should lend itself admirably to producing heat in vascular tissue.

Comparative tests have actually shown that electromagnetic induction, or inductothermy as it has been called, provides the most effective method today for producing heat in tissues. With inductothermy, there need be no surface electrodes; furthermore, fat is not excessively heated as in the case of the condenser method. The treatment of obese persons is therefore made possible without causing great discomfort.

Finds Many Applications

Inductothermy has been very successfully used to combat bursitis. Bursae are small, flat, closed sacs lying between tendons and muscles. Normally they contain a little thin liquid; however, due to certain types of fatigue, no doubt, they become filled with a lime deposit easily detected by means of X-rays. The most susceptible spot for a formation of this sort is just over the sharp angle of the shoulder, which usually becomes very stiff and painful. Formerly the only cure was the surgical removal of the deposit; now, however, it has been found that inductrothermy will completely remove the lime with little or no inconvenience to the patient. Just why the method is successful is not definitely known. There is a possibility that lactic acid formed during fatigue dissolves calcareous material from near-by bones and deposits it in the bursae. The existence of supersaturated solutions which suddenly precipitate out part of the solute might also help to explain the action. Obviously the heat produced by the high frequency currents affects the solubility of the deposit, explaining in one manner its disappearance.

Paresis is another malaise that is helped by inductopyrexia. Intentional use of malarial fever to effect a cure will probably soon be entirely supplanted by the electrical method. The possibilities of industrothermy have by no means been completely discovered. With the improvement of apparatus and the increasing amount of data obtained from research, much can yet be expected. —H. McS., W9DPD.

Radiography Serves Industry

Applications Flourish Under Influence of Extensive Research

IN THE present age the comfort and even the lives of human beings are dependent upon the performance of man-made structures and mechanisms. Any method which will aid in determining whether or not a given material is suitable for the service for which it is intended is not only a very useful tool for industry but is also a gift to society. Radiography is such a method. Industrial radiography is the study of conditions within materials by means of photographic records made with X-rays or gamma rays.

Applications Unlimited

The applications of this new method of testing are not limited to those materials which are strictly called engineering materials, for almost any material in any form may be tested nondestructively by the use of radiography. No golfer would consider using a golf ball which was not perfectly spherical, yet they will use balls having flattened cores that effect the play-ability of the ball probably as much as the covers. But how is it possible to actually see this core without removing the cover and thus destroying the ball? Exographs, pictures taken by means of X-rays, will allow an inspection of the core to determine the quality of the ball.

Tooth paste is a very familiar material and is accepted as one of the necessities of life, but for convenient use it must have certain physical properties. It must not be too stiff for it will not flow from the tube. It must be thoroughly mixed without being allowed to become full of air bubbles which would make a short weight tube. By making studies of the condition of the paste after it has been forced into the container, a mix can be determined which would give the paste more convenient physical properties. These studies are made by the use of X-rays.

A well-known candy manufacturer has installed fluoroscopes in order to detect any inclusions of foreign matter in the raw material as it enters the plant or in the finished product as it leaves the factory. The fluoroscope is an instrument which takes advantage of the penetrating ability of X-rays, but does not make a permanent record on film of what the X-rays show. The application of these radiations came as the result of an expensive suit brought against the company by a customer who had been placed in a serious condition as the result of eating a piece of fine wire which had been included in a piece of candy.

Development Is Interesting

After mentioning a few of the applications of X-rays which enter quite intimately into our lives, it should be interesting to trace the development of this relatively new industrial tool. In 1895 Professor Wilhelm Konrad Roentgen was studying electrical discharges through gases. One day, while working on these experiments, he noticed that a fluorescent screen which had been placed on a table about ten or twelve feet away from a cathode ray tube was glowing brightly. The radiations from this cathode ray tube which caused this fluorescence were unknown; so, for want of a better name, they became known as "X" radiations and later as X-rays. The "X" indicating the unknown quantity of algebraic fame.

Before 1912, X-rays did not find successful application in any fields besides those of surgery and dentistry, but in these fields X-rays and their cousins, gamma rays given off from radium, have been of great use to man. Now the X-ray department is an essential part of the equipment of every hospital. The medical applications of these rays are classified as diagnosis and therapy. Broken bones have been set, internal tumors discovered, foreign bodies located exactly and extracted without guess work, and tuberculosis indicated or disproved with the use of X-rays.

After 1912, the development of the Coolidge X-ray tube revolutionized radiographic technique. This tube could operate under voltages high enough to produce rays of satisfactory penetrating power for industrial use. X-rays are radiations that result from a high velocity stream of electrons striking some dense metal of high melting point such as tungsten. The electrons are made to flow at high velocities by keeping a great difference of potential between the heated filament producing the electrons and the target in which the electrons lose their energy. It can be seen then that the voltage under which an X-ray machine is operating will have a considerable effect upon the generated radiation. With the Coolidge tube the penetrating power and the intensity of the X-rays are increased and each of these characteristics can be controlled independently of the other.

World War Provides Many Applications

The World war brought about the development of many useful applications of X-rays. Light wooden struts for aircraft were photographed with these rays and any serious defects in the wood structure shown. Fuse assemblies of high explosive shells were examined by fluoroscopes. Much use of fluoroscopes was made in the examination of packages and cartons suspected of having contraband concealed in them. Such methods are still used today by the postoffice department in the examination of parcels thought to have bombs and similar contrivances concealed in

them. Attempts made to apply the use of X-rays in metallurgical practice at this time were not particularly successful because the tubes available could not be used with more than 125,000 volts; and, as a consequence, unduly long exposures were required for radiographs through more than an inch and a half of steel.

Properties Discussed

In the preceding paragraphs the properties of these somewhat mysterious radiations have been more or less hinted at, so that it now remains to put these down definitely and see what use is made of them at present in some industrial processes. The visible electromagnetic vibrations or waves called light vary in color according to wave lengths. X-rays are like light in some ways: they affect photographic film, they are refracted in passing from air to a solid, they may be reflected under special conditions from mirrors, and they can be polarized. There are, however, marked differences between X-rays and light. The most significant difference between them is that X-rays are able to penetrate objects opaque to ordinary light and reveal the internal structure, whereas visual light is reflected from the surfaces. It has been found that at least part of the cosmic rays, the gamma radiations, X-rays, ultra-violet light, infra-red or heat rays and radio waves all have fundamental similarities; they differ only in wave length. All are electro-magnetic vibrations or light waves; but where visual light waves have wave lengths in the range of 3900 to 7700 Angstrom units (one Angstrom unit is equal to 0.00000001 centimeters), the x-radiations have wave lengths in the range from 1000 down to .06 Angstrom units. Only those having the lowest wave lengths can be used in industry. Their penetrating power is due solely to their short wave lengths.

The amount of absorption of these radiations is proportional to the density of the material being examined; therefore, radiographs show differences in density or lack of homogeneity. This principle accounts for the variation in thickness of different metals which can be radiographed with a constant source of X-rays. Aluminum six to eight inches thick can be easily radiographed while a ¾ inch thickness of lead will absorb almost completely the output of a 400,000 volt machine because it is so much more dense than aluminum.

At first, the use of X-rays in industry was restricted to research purposes alone, but now they are a recognized means for controlling production. Nearly every manufacturer has some problem which lends itself to radiographic examination.

Weld Inspecting

The earliest recognized application of X-rays in industry was radiographic inspection of welds. The voltage of the earlier machines used in this work was limited to 220,000 volts, and the examination of welds in plate more than 3 inches thick was not practical. Since the A. S. M. E. approved fusion welding for pressure vessels in 1931, provided that the welds were inspected by means of radiographs, some 20 manufacurers have installed nearly 50 X-ray units. Some 800,000 feet of welded joints in 7,000 pressure vessels having plates ¼ to 4½ inches thick have been examined in this manner. The welded steel penstocks at Boulder dam constituted the largest single welding contract to be subject to this method of inspection. Approximately 75 miles of welding in steel plate from 1 to 3 inches thick was examined. The penstocks of Morris dam were tested in a similar manner.

Castings Examined

Castings may be examined by X-rays to show such faults as gas inclusion, sand and slag inclusion, cracks, pipes, spongy metal, and shrinkage. This method of examination can be used for research towards the development of proper technique, to aid in the salvage of poor castings by welding, and to reduce the amount of metal necessary to produce a given casting by better placing of gates, sprues, and risers with possible elimination of some. By using such means one company developed a much better method of molding a large casting with the result that their yield is 78 per cent effective, where it was only 39 per cent. All of the pipes, fittings, and turbine shells for a 1,200 pound steam line for a large electric power station were tested by X-rays to determine their soundness.

Radio Provides Many Problems

High voltage bushings for transformers and oil switches can be radiographed to determine the solidity of the insulating material between the conductor and the outer porcelain shell. Plastic molded parts containing metal inserts may be placed under a fluoroscope in order to show the exact position of the inserts. A manufacturer of tubes for wireless transmission radiographs all tubes to make sure that the filament and grid units are properly placed. Mica sheets are examined for the presence of foreign material which would detract from their value as insulators in heating elements. Investigations have been made on reinforced and plain concrete structures where radiography offers a means of determining whether there has been an internal rupture while setting and whether the reinforcing members have retained the correct positions.

Radiography Used to Examine Paintings

Radiography has provided two other interesting applications in what could hardly be called a strictly engineering sense. Real and spurious gems can be distinguished. A genuine diamond casts a barely susceptible shadow, a sapphire a somewhat heavier shadow, while a rhinestone presents a black silhouette. Real pearls fluoresce under the rays while imitations remain dull and lifeless. Examination of paintings have sometimes revealed clever forgeries and also where a master has changed his mind while working. Exographs of paintings can be made to suppress the superficial work and bring out the underlying picture.

In the story of X-rays is the story of many developments. Discovered by accident, experimented with patiently for years, theories developed and tested in the laboratory, applied to research problems, and finally used in industry for the production of better and safer products. —M. H.

Germans today are trying to invent a new type of internal combustion engine that will burn gas as well as oil.

Since the beginning of mathematics, professors have said that it is impossible to trisect an angle. Despite his professional rank, it took a Columbia professor several weeks to disprove a solution to this so called unsolvable problem when it was submitted by an eleven year old boy.

AUTOMOBILES

The modern car is greatly aided by the modern road which is a thing of beauty and smoothness and is under repair two miles ahead. To avoid repair stretches, the driver takes curious routes known as detours. A great many people who have taken these have never been heard of since, but I have not as yet obtained statistics to prove whether this is definitely or definitely not a good thing.

Automobiles nowadays have many fine accessories which make them a big improvement over the old ones. There is, for instance, a mirror on the windshield which enables women sitting next to the driver to see whether they have put on too much powder and lipstick. Sometimes men drivers fiddle with these mirrors, and turn them so they can see the road in back of them, but inventors are working on a fiddle-proof mirror which will only reflect the visage of the fair occupant in the right-hand front seat.

Another good accessory is the ash-tray which is made very small so that it will soon be full and people can then go tossing cigarette butts into passing cars or dry grass on the roadside as usual. Radios are also in many up-to-date cars and enable one to learn in almost no time at all that there is an awful traffic jam up ahead.

Without the present-day service station you would get practically nowhere. There you can get water, air for your tires, candy, chewing gum, have your windshield polished, get a manicure, and even get gas if you insist on it. We would be absolutely nowhere without automobiles these days, and neither would the traffic cops.

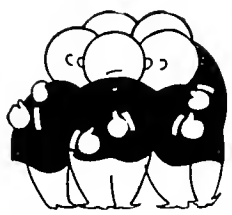
(*NOTE: Reprinted by permission of Coronet and Parke Cummings, author.*)

AMONG OUR SOCIETIES

GOODRICH TALKS ON SAN FRANCISCO-OAKLAND BAY BRIDGE

The Central Illinois section of the A. S. C. E. held an open meeting on the campus the evening of Thursday, December 10, 1936. C. F. Goodrich, chief engineer of the American Bridge Company, presented a non-technical talk on the construction of the San Francisco-Oakland Bay Bridge. After comparing the bridge with other large bridges, Mr. Goodrich outlined the steps in the fabrication and erection of the bridge. Slides showing views of different parts of the bridge during construction helped illustrate his description of the cable spinning operations, the building of the suspension towers, the erection of the cantilever span, and other interesting features. The talk was followed by a sound movie taken of the construction of the bridge. From the two, Mr. Goodrich's talk and the sound picture, an audience of over five hundred faculty, students, and members of the society obtained a very good idea of the principal construction features of this bridge.

The student chapter of the A. S. C. E. presented Albert Smith, president of Smith and Brown, Engineers, Inc., and formerly professor of civil engineering at Purdue university, on Wednesday, December 9. His talk, entitled "Responsible Charge," brought out the factors which help a man advance in the engineering profession.



MINERAL INDUSTRIES SOCIETY

The Mineral Industries Society enjoyed movie talks by Mr. Soule, president of the Coal Sales Corp. of Chicago, and Warren Penwell, president of the Penwell Coal Mining Co., at recent meetings. An interesting talk on "Copper and It's Alloys" was presented before the society by H. W. Butterbaugh, technical supervisor of the American Brass Co. The year's program, however, is just begun, for the society promises many more speakers to come among who are: John E. Jones, safety engineer of the Old Ben Mines, D. B. Reeder of the Electro-metallurgical Co., G. A. Lilliequvist, resident metallurgist of the American Steel Foundries, Dr. M. A. Grossmann, director of research for the Carnegie Illinois Steel Corp., and H. A. Zieler, president of E. Leitz, Inc. The society innovated an interesting feature during the past semester's program with a successful radio dance held in the new Metallurgy laboratory. There was more than the enthusiastic comment of those in charge to prove its success, for the social was well attended by both faculty and students.

A. I. E. E.

Dr. Charles F. Hottes, head of the department of botany, presented moving pictures of his recent trip to Alaska at a social meeting of the A.I.E.E. on December 16. Judging from the reactions, many of the members and their guests had a narrow escape from the bite of the travel bug. At another of the society's recent meetings, L. P. Kingsley of the Anaconda Wire and Cable company, showed motion pictures entitled "The Manufacture of Paper and Lead Covered Cables." During the picture he explained the manufacturing processes shown.

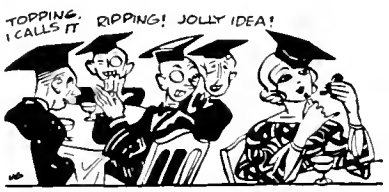
A. I. C. E.

In its December meetings the American Institute of Chemical Engineers presented talks on filtration and coal. K. K. Kearby, special research assistant in chemistry, discussed "Filtration Processes." Besides illustrating his description of the various filtration methods with slides, he pointed out the advantages of diatomaceous silica for this process. Diatomaceous silica, 93 per cent pure silica, is the result of deep-sea depositions of minute oxidized marine organisms. Through geological disturbances these deposits are brought to the earth's surface. According to Mr. Kearby, this material is widely used by filtration engineering companies. The other speaker was R. C. Theissen, professor of geology at Pittsburgh and of the Bureau of Mines. He pointed out that the study of coal as a subject required basic knowledge of many branches of science. Biology is especially important, because coal is formed from ancient plants of past geologic ages. With the aid of slides, Mr. Theissen portrayed the steps in the formation of coal from peat bogs to anthracite.

A. S. M. E.

Student talks on current engineering topics were sponsored by the student branch of the A. S. M. E. at recent meetings. The first of these were presented on December 9, whn J. H. Coulter spoke on "Mechanized Cavelry" and C. F. Erickson spoke on "Ball Bearings." On December 16, C. H. Dunn and D. F. Lannert discussed "Tractor Breakdown Tests" and "Dye Testing of Metals," respectively. The last of this series was presented on January 13, when M. S. Wilson spoke on "The Function of the Metallurgical department in Inspection and Production Control." The second talk at this meeting was an illustrated one by C. E. Beck on the "Progress in Design, Development, and Application of Diesel Engines." Although the attendance at these meetings was not as large as it should have been, the talks were well received.

Charles M. Wilson, professor of police science and research engineer for the Northwestern Law School crime laboratory, spoke before the society on January 13. His subject was "Crime Detection by Scientific Methods" and was interestingly illustrated by many slides. On January 20 the representative of a large machine demonstration house spoke about machinery.



CERAMIC GLANCES

In line with its policy of presenting prominent speakers to its members, the Student Branch of the American Ceramic Society was honored by the visits of Dr. G. L. Clark of the Department of Chemistry, and of Mr. F. C. Flint, president of the American Ceramic Society.

Dr. Clark, who spoke on the subject of X-rays, inspired the article, Radiography Serves Industry, to be found elsewhere in this issue.

Mr. Flint gave a non-technical and highly amusing talk concerning his visit to the recent glass congress held in London. Twenty-three countries were represented at this conference, the United States having the largest foreign delegation of 24 members. All delegates were greeted very cordially, but the manner in which the president of the delegation was treated, compared favorably with the treatment accorded only the English Royalty. For two weeks, Mr. Flint as president of the U. S. delegation, enjoyed a prestige and attention which he had never experienced in America.

Exceedingly interesting and amusing to the American delegation was the extreme formality with which the meetings were conducted. The opening meeting will serve as an excellent example. The Duke of Kent was the presiding officer, but before he could speak he had to be introduced by a lord, who in turn was presented by a proper introducer, an earl or his equivalent. As soon as all introductions were over, Mr. Flint was told that he was expected to deliver an answering speech, shake hands with the Duke of Kent, and then take a seat in the first row. He was visibly shaken and very tense since he had no idea of what to say, then again he had no desire to sit in the "bald head row," and lastly he was uneducated in the manner of shaking hands with the Duke, having had no previous experience.

When these obstacles were finally overcome, Mr. Flint and the other delegations were free to visit nearby ceramic plants and indulge in the inevitable teas. However, there was one factor that caused some very solemn discussion among the delegates present, the question of war. No matter what the European people do, they can never forget the everpresent danger of war. It was sincerely hoped that the London congress would bring good will and better understanding between nations and help avert a repetition of the 1914 conflagration.

Electric switches that do not click have been developed.

ENGINEER'S USE OF MODELS . . .

. . . *As Experimental Aid*

ENGINEERING research is a valuable aid to the solution of design problems in every branch of the profession. Studying full-size materials under actual field conditions is desirable; but, practically, impossible because of the expenditure of time and money involved. The use of the model has provided a broader scope for experimentation. Not all models are built for testing, however, for many are used experimentally to determine the design easiest to construct and the best in appearance.

San Francisco-Oakland Bridge

During the preliminary investigations for the San Francisco-Oakland Bay Bridge, the engineers made considerable use of a model. Now the model is in the contractor's hands, being used as an aid in the economical erection of the steel truss. The floor truss was omitted, and the erection schedule of the steel truss was worked out to the best advantage. After this the schedule for placing the concrete paving was worked out. The predictions as to what the actual reactions on the towers and cables would be were found to be very close.

One recent model study, by the Nela Park Engineering Department, was carried on for the study of highway illumination. The model road was 250 feet long representing 2,000 feet of actual roadway. Five different types of pavements were tested, and sodium vapor, mercury vapor, and incandescent lighting systems were used individually under each of these conditions. Very satisfactory results were obtained from the investigations carried on with this model.

Even the foundries have gone in for model building. To get satisfactory casts they find that it is best to make a few trials and test these trial castings for imperfections. When new types of castings are required, it is especially important that this be done in order to turn out satisfaetory work. However, when big pieces are being made, the full scale trials are too expensive, so scale models are used with very good results.

Automobile Design

Automobile manufacturers have for some time been making use of models in designing their new cars. One of the pioneers in this work first made a small wooden model, and then when a satisfactory design was found, a full scale model was made and everything worked out in minute detail. Another company starts with a full scale blackboard drawing. Their next step is to make a full scale elay model, about two inches of clay over a framework of wood, and the body shapes are all worked out into a good looking design. A wooden model, accurate to the finest detail, is then made; and, when finished, it can be told from the aetual car only with diffieulty.

In the design of the new fast trains, model tests were first made to determine the best designs for high speeds. Wind tunnels are used to a great extent in this work. The final appearance is also aided by the results of the model designs.

Aviation Research

From the ground we go up into the air for our next story of models. All model airplane builders are not just passing away their time, because some of the large airplane companies and the government are making use of models in testing new designs of ships. The government is especially active in testing models of new fighting and transport ships in its large wind tunnels. Many things have been learned

—*Courtesy Mechanical Engineering.*

Model of Cape Cod Canal

through this type of aeronautical investigation that have done much to cause the rapid advance of American aviation. Everything from the propeller to the tail-skid must go through rigorous tests to determine the most efficient design. Nothing is missed.

A zeppelin corporation recently carried on an extensive investigation studying the stresses and strains that might be expected in the structural members under every possible loading to be expected while the ship was in use. The model was built of celluloid and fine wire. Special strain gauges were developed for use in these studies.

The marine designer employs models in more than one way. Since speed is a controlling factor, there is much work carried on in selecting the hull that, under the varying surface conditions, will pass through the water with the least resistance. The pitch of the propellers is also subject to intensive experimentation. Finally, the shape of the stern in relation to the currents set up in the water is thoroughly investigated.

Studies of wind stresses have been made on models of high buildings, gas tanks, bridges, and other structures so affected. In most of this work, the models are constructed of thin celluloid sheets. Polarized light, when directed on a model, will reveal the varying stresses in the members by a difference in their depth of color.

Hydraulics furnishes a fertile field for model study. Sewage disposal plants are within this classification and considerable investigation has been made, especially in the design of the outlet channels. Models were successfully used in solving the problem of building large reservoirs. Here much is taken into consideration—the topography of the dam site, the placement of intake towers and gates, the design of outlet tunnels, stilling basin, outlet channel, and spillway. The forces aeting on the dam, and the proper design of the various parts of the water-carrying channels are among the things being investigated. The Massaehussetts Institute of Technology studied a typical problem with its model of the Cape Cod Canal.

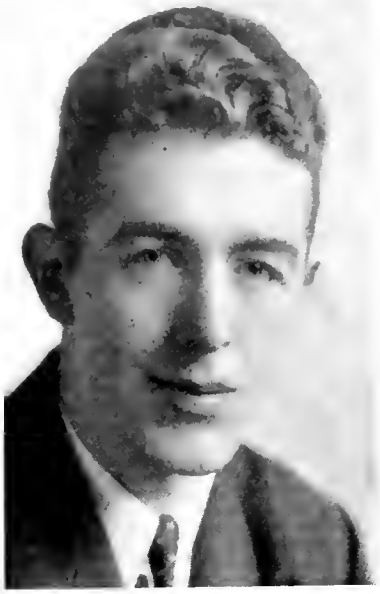
In working out drainage changes and erosional action, models can sometimes be used, but the disadvantage is that a substance that will scale down for sand is not very easy to find, and consequently the carriage of sand by the water in actuality is not the same as it would be for the model. However, models of rivers have been used in studying various problems. For example, the ravages of the Yangtze River in China are being combatted by a eareful study of similar conditions in a model river.

Plan Your "Dream House"

Models have even invaded the field of architecture, for now the fashion of planning your new home is to build a cardboard miniature, complete to the landscaping. This permits you to see for yourself just about how the house of your dreams will look before you even take out the first shovel of dirt for the basement.

Perhaps from this article, it would seem that models are the ideal way to conduct experiments and tests. However, this is not true because every element of construction cannot be scaled down to equal proportions, nor can suitable materials for building the model always be secured. Then, too, there are limitations to the conclusions that can be deduced solely upon the basis of experimental results.—H. G.

• WHO'S WHO IN ILLI



● *Amzi Gossard*

● *Herbert McSkimin*

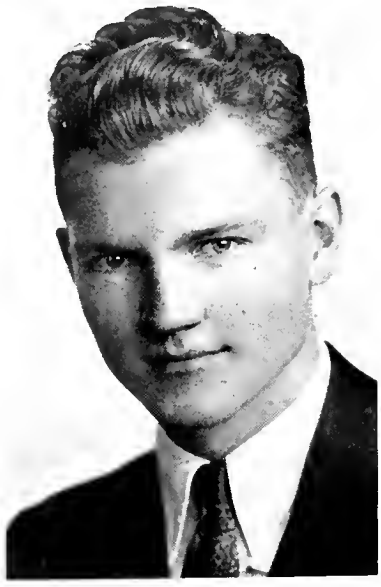
● *Harlan Oehler*

AMZI GARRISON GOSSARD is most aptly named, for the uninformed often mistake his deep booming voice for that of an approaching garrison; and yet this Mr. Gossard is surprisingly reticent on paper. All he states about himself is this: "Born in Hammond, Indiana. Lived in Peoria for 16 years. Went to Peoria high school four years. After completing high school, went to Bradley Polytechnic Institute for one year. Have attended University of Illinois for the last three years. I am in the coal mining option of the mining engineering curriculum. I am planning to attend the A.I.M.E. national meeting in February in New York City as a representative of the Mineral Industries Society." One of his prominent fellow students, however, says of Gossard: "Member of Mineral Industries Society and A. I.M.E. since coming to school. Willing and aggressive worker in connection with these and all departmental affairs, and in studies. Grades good. Lots of energy. Just now he is contributing largely to plans for a new layout and construction to be proposed for the Mining laboratory. Usually hear him before you see him (big voice) although he is six feet and doesn't try to hide. Knows grocery stores from the ground up. Worked at Caterpillar plant last summer. Noted for his loyalty to his unusually attractive girl friend 'back home.'"

HERBERT McSKIMIN, whom the amateur radio world knows as W9DPD, had all his schooling, including two years at Bradley Polytechnic Institute, in his home town of Peoria before deciding to pull up stakes and become an E.E. at Illinois. His watch chain is stressed with the best, for it supports emblems of the following: Epsilon Phi Alpha (honorary science fraternity at Bradley Tech), Eta Kappa Nu (of which he is treasurer), Tau Beta Pi, and Phi Kappa Phi. Herb is also a member of the A.I.E.E. and is secretary of Synton. His pet hobby is amateur radio; he has been licensed since 1931, and, before coming to the University, was an active member of the Army Amateur Radio system. He is also interested in photography, meteorology, and good music (the latter probably being a reaction to his own struggles on the violin). He states that he has positively no pet peeves. He lives only two blocks from the engineering buildings, but finds it pleasant and profitable to ride a bicycle. Conveniently neglecting tire wear, he estimates that the wheel has paid for itself in the saving of shoe leather alone.

HARLAN OEHLER increased by one the population of Dubuque, Iowa, back in 1913. In 1917 he moved to Chicago, and in 1928 to far away Oregon. Then the Middle West re-asserted itself, and Harlan was back in Chicago before 1930 had expired. He worked as an office boy for N.B.C. until 1932, then attended Crane Junior college and later Chicago Junior college until 1935 when he came to the University of Illinois and enrolled in metallurgical engineering. Harlan (whose last name is pronounced Aylor) belongs to all sorts of organizations. Gird yourself and listen: Alpha Chi Sigma, Tau Beta Pi, Phi Kappa Phi, Mineral Industries Society, Institute of Radio Engineers, American Radio Relay League, American Society for Metals, and American Institute of Mining and Metallurgical Engineers! Harlan is interested in radio and has a commercial license. Last summer he worked for the Carnegie-Illinois Steel corporation and has a leave of absence at present. He is doing senior thesis work under T. J. Dolan, which has a most imposing designation, but sounds interesting for all that. His work is on stress concentration in bending fatigue due to holes, fillets, and corrosion, and a continuation of Dale Streid's thesis on torsional fatigue. Here's a prophecy that Harlan goes somewhere in this world of ours. Watch for that name Oehler—and when you see it pronounce it Aylor.

NGINEERING WORLD •



Maurice Harvey •

Frank W. Andrew •

Walter A. Renner •

WALTER A. RENNER, of the Aurora Renners, is a military man, being in the advanced corps and a member of Tau Nu Tau, but it must be added (with apologies for the double pun), that Walt is a civil person for all that, for he is not only most congenial, but has been struggling these many years as a C.E. But Walt's versatility isn't limited to plays on words. Aside from battling his school work, which he has done so well that he is a member of Tau Beta Pi and secretary of Chi Epsilon, Walt earns his way through school by being a student assistant at the Surveying building and officiating as a meat cutter in a local store. At present he is giving himself another lift by making a determination of the amount of water of infiltration in Champaign sewer pipes; and finally, in the summer he divides his time between surveying for an engineering concern in Aurora and inspecting street constructions in that city. Walt's activity list tells us that he is a member of the A.S.C.E.; it should contain "business manager of the Technograph," but he was forced to give that up because of ill health. Walt's hobbies include fishing, mathematics, and amateur astronomy.

FRANK W. ANDREW is, unfortunately, little known to the majority of Illini engineers, but he hopes to change all this next semester by transferring from Ag Engineering to the College of Engineering. Frank started to earn his way through school by beginning at the self-help college of Blackburn at Carlinville, Illinois. As a sophomore there he held the position of Work manager. Upon coming to the University of Illinois, he and his brother turned bachelors, wielding the skillet with much grace. F.E.R.A. gave a helping hand and F.W.A. found himself over in M.T.L. making frames for laboratory charts and pictures. Incidentally, under the supervision of Professor J. O. Draffin, he made the "Welcome" signs seen in the Engineering buildings. Last spring the Ag Engineering club and the Student Branch of the A.S.A.E. elected Frank president. He also finds time to be in the Men's Glee club, and to work for room, board, laundry, and have a bit extra. Last summer he farmed, worked in the refrigerator repair business, took a trip to the national meeting of the A.S.A.E., spent a month remodeling a farm house, and built a couple of wind electric plants. This last is his pet hobby. He likes to figure skate, although he holds the record for the greatest number of falls per square yard of ice. He thinks a bicycle, next to the slide rule, is the student engineer's best friend, and even rides it to get his date.

MAURICE HARVEY is indeed a personification of the true engineering spirit. He supplied the facts of this sketch in a concise outline consisting of eight subheads and entitled "data sheet." The Technograph Who's Who Engineering Bureau here presents a dissertation designed on the basis of the facts given and sufficiently interspersed with conjunctions and the like to allow it to conform to the requirements in evidence. Ahem! SOLUTION: Maurice Eugene Harvey was born in Genoa, Illinois. He graduated from the Elgin high school in 1933. As a student at the University his memberships and activities are as follows: Phi Eta Sigma, Pi Tau Sigma, Tau Beta Pi, A.S.M.E., editorial staff of the Technograph, and student assistant in the Engineering Library. Experience: Laborer on construction work, stock farm hand, salesman of electrical appliances. Travel: Made week-end trips to Chicago while in high school to visit points of interest; occasional trips to Colorado; some years ago visited the high spots of the East. Hobbies: Music in high school, model planes, ice skating, and bicycle riding in the country. Eccentricity: Not much of a ladies' man.

THE RIGHT ANGLE . . .

Utility of Reflection

Experience is acclaimed the greatest teacher. Upon it depends a creditable engineering judgment. Because of the potency of experience in molding lives, it is important that from time to time one reflects a bit in an effort to decide whether or not his experiences have been vital. This conscious effort to survey the past, to criticise personal performance, and then to determinedly carry through a revised program with two purposes in mind: (1) to prepare one's self for appreciating the vitalness of each new experience, and (2) to deliberately place one's self in a position that will afford the greatest number of worth-while experiences is effective mental discipline. There are individual differences in a suitable definition of what is worth while, but serious retrospection is generally conceded important.

One-half the school year is past. A new beginning faces the engineering student. An opportunity for reflection is available and necessary. What questions present themselves to the different students?

In the predominate category one finds the senior who has gone through four years of college with every chance to develop his intellect. Yet, if he has successfully pursued but this one goal, he will not find his profession welcoming him with outstretched hands. The modern engineer is no longer a social outcast. Society demands that he be a human being and not simply a device for juggling formulae. The responsibility of his work requires that he work co-operatively with other men, presuming, of course, an understanding of human nature so characteristic of leaders. Has the senior demonstrated to himself the personal development of these traits? Has he cultivated recreational habits that will be permanently satiable?

The story of entering into activities is being told over and over again, and with each re-telling attracts more attention among the students. Why? Because it is here that one may learn the meaning of diplomacy, leadership, ingenuity, and perhaps earn a chance to exercise executive authority. The editorial *The Engineer and Culture* in the last issue of the Technograph makes it unnecessary to re-emphasize the importance of the engineer's cultural development. The entire university is the engineering student's playground. Even the overly popularized *bull session* adds to the student's social training, although its contribution should not be unnecessarily magnified.

With these questions in mind the senior faces the future. Four years have slipped by quickly enough, too quickly for some. It will have been a profitable time for those men, however, who now critically adjust themselves to meet the future squarely.

The freshman, too, should face the future with an eye to the past. If his views of college life were a bit too colored, they are considerably toned since September. He has learned the importance of putting solid foundations under his dream castles. Hard work, sensibly directed, will provide tangibility to his hopes. Upon his initiative depends the expansion of his character. Now, indubitably, is the time to plan an effective college career. Four years poorly utilized will find the optimistic freshman a disappointed senior.

The sophomore and the junior need little attention. They are in a transitional stage between two groups of beginners, the seniors and the freshmen. Perhaps it would be advisable for them to be cautious about that feeling of expanding importance. This self confidence should have some basis, either upon scholastic, social, or cultural achievement, preferably upon the combination of them all.

Although the questions and conceptions presented may not agree with the reader's view point, he will indulgently concede that reflection is healthy. It may not always leave one in a pleasant mood, but certainly it will invoke thought. Even if that were its only merit, stagnancy in life would hardly be possible. A young pup seizes a glove and tugs at it with every playful, but determined, shake of the head. It is with this whole-hearted enthusiasm that life must be met if one expects to be happy. This ability for self criticism is difficult to master, but it will prepare the mind for professional, cultural, and social expansion!

Civil engineering students, especially those interested in structural engineering, were sorry to learn that Professor Hardy Cross is leaving the campus at the end of this school year. Professor Cross, who has been at the University for 16 years and is an authority in the field of structural engineering, will become professor of civil engineering and chairman of the department at Yale university.

Engineering Open House

Engineering Open House was taken over by the Engineering Council two years ago and managed so successfully that it has become a feature of the students' activity calendar. This year Open House will occur in the middle of April. There were upwards of 6,000 visitors attracted two years ago, and with the early start made this year more are expected. Open House is not simply a local event. Here is an opportunity for individual cooperation. Every engineer may contribute his help either in preparing exhibits or in advertising the show. It is the student's chance to show what his profession offers. How he displays it depends upon his skill and ingenuity. Open House, more perhaps than any other single event, bears the importance of the adage, *You get out only what you put in.* Engineers should talk about this to their friends at home as well as those in school. People must be made aware that engineering is interesting and important. The success of the show depends upon you, who read this. Contact the Technograph, your departmental society, or your instructors, and offer *your* services. If you are interested, Open House will be interesting!

...WHEN HE WAS VERY YOUNG

As small boys, many fathers now living knew the telephone only as a little used curiosity. It grew into today's constantly used necessity largely because the Bell System never ceased looking for the new and better way. It stayed *young* in its thinking.

Young ideas developed "conference service", enabling several nearby or widely separated persons to talk on one telephone connection. Young ideas steadily made Long Distance service better, quicker, yet cheaper.

Young ideas are at work day and night to make sure America continues to get more and better service for its telephone dollar.

Why not call Mother or Dad tonight?
Rates to most points are lowest after 7 P. M.

BELL TELEPHONE SYSTEM

WILL

"On the Campus of the University of Illinois, at Urbana-Champaign"

BY LAW, radio broadcast stations are operated "in the public interest, convenience, and necessity." If by any means a station can offer better service to its listeners, mutual benefits will be derived by both the listeners and the operators of the station.

Since the University of Illinois radio station, WILL, was first built, it has been continually in the process of revision so that the latest in program and equipment control methods are always to be found there. However, there was the realization, by University officials and W. E. Phillips, Chief Engineer of WILL, that better service might be extended to WILL listeners by a major change of the station layout. Therefore, two years ago legal proceedings were started before the Federal Communications Commission in Washington, D. C., for the purpose of securing a more advantageous frequency allocation, a change of location of the transmitter, and an improved transmitting antenna. Permission for the above changes was granted by the Commission this fall, and for the past several months Mr. Phillips and several assistants have been working out the engineering problems which the proposed changes present.

New Site for Old Station

The site chosen for the new WILL is on the South First Street Road, one and one-half miles south of Memorial Stadium. At present a modern, frame transmitter-building with a floor size of approximately twenty by thirty-six feet, is being erected. This building will house the present broadcast transmitter and its associated power supplies and speech equipment.

Of course, one of the main reasons for all the expense and trouble of incorporating improvements in the station, is to increase its "primary service area." The primary service area of a broadcast transmitter is the area reached by signals from the transmitter of such strength that no trouble is encountered by the listeners in receiving them, even under adverse conditions, such as static or electrical interference.

The new frequency allocated to WILL is 580 kilocycles, the present frequency being 890 kilocycles. The lower frequency will account for a considerable increase in primary service area, as will also the remote location away from impeding buildings, trees, and other obstructions to technically perfect transmitting conditions.

Antenna System

One of the most interesting things about the new station, both to the layman and to the engineer, is the antenna system. "Antenna system" to many people means a pair of windmill towers with a few wires strung haphazardly between them. The WILL antenna system, however, will employ an entirely different method of radiating the signals from the transmitter. Twin towers are being erected for this purpose, these towers being known, technically, as "vertical radiators." That is, the towers, or vertical radiators, are the antenna. They are insulated from earth by porcelain blocks at the base. There are no wires strung between them, nor are there any guy wires used for support. The radiators are each 325 feet in height, which is more than twice the height of the present towers back of the Old Gym.

These vertical radiators are fed independently from the transmitter by co-axial cable buried in the earth. The co-axial cable consists of ⅞ inch copper tubing with the copper feed wire running co-axially inside the tubing and insulated from it by isolantite bush-

ings. After installation, the cable will be connected to vacuum pumps and the air exhausted. At the same time an inert gas, nitrogen, is introduced. After the cable is completely filled with nitrogen, the nitrogen pressure is raised above atmospheric to prevent air leakage back into the cable. The nitrogen atmosphere inside the cable prevents voltage breakdown and deterioration.

The ground system of a broadcasting station is of nearly as much importance as its antenna system. The ground system at the new location will consist of 120 copper wires running radially from the base of each vertical radiating tower. Each of these copper wires is 350 feet long, 84,000 feet of No. 8 copper wire being used. As each of these wires must be buried in the earth for permanency, a special "plow" was developed by the Physical Plant of the University for the purpose of digging the 240 trenches required for the wires.

While the above discussion presents the physical aspects of the new station it does not explain the "why" of the two vertical radiators and their independent co-axial feed lines. It so happens that radio station WIBW, of Topeka, Kansas, operates on the same frequency as WILL will eventually occupy. To prevent interference between the two stations, therefore, it is necessary that WILL, by some means, cut down their signal strength in the direction of Kansas to such an extent that from the Iowa-Illinois state line (roughly) the signals from WILL will be so weak that those from WIBW will completely override them. To accomplish this cutting down of the signal strength in a westerly direction, the two vertical radiators are employed as a directional radiating system. The phase relation of the currents flowing in them is then adjusted by varying the phase relation of the currents at the input end of the co-axial cable feed lines. In other words, adjustments are made in the currents flowing in the vertical radiators so that people in Iowa and Kansas will be unable to hear WILL, while at the same time, anyone in the state of Illinois will enjoy a strong signal from the University station.

To secure this state of affairs requires the highest type of engineering, as well as attention to innumerable details. The complete design of the new WILL and the construction of the majority of the equipment used in its construction is being handled by Chief Engineer Phillips, and other University technicians.

When the transmitter is completed, which will be sometime in the coming spring, the complete arrangement of the station will be somewhat as follows:

Programs will originate at enlarged studios at the old studio-transmitter building on Wright Street. These will be connected by wire line with the new transmitter building south of Memorial Stadium, at which point the programs will be broadcast. An exception to this sequence will be remote, or "nemo," pickups from points of interest on the campus, such as Memorial Stadium, Smith Music Hall, dance halls, etc. If the program does not originate in the studios, i. e., if it is a "remote," it will be fed to the studio building where it will be monitored, and then fed over the telephone line to the new transmitter.

A future article is planned which will explain in more detail this technically beautiful piece of engineering which is now taking place on our campus.

R.A.K.—W9DKP.

FOLLOWING THE PROFESSION

—Courtesy Technology Review.

Largest Hingeless, Box-Girder, Single-Arch Span in the World—Hendrik Hudson Memorial Bridge, New York City

Artificial Tunnel

For a long time the tracks of the New York Central railroad made an unsightly gash in beautiful Riverside Park along the Hudson river waterfront. Soon, however, they will be hidden from view by one of the largest construction operations in New York City. The New York City park department, together with the New York Central, have planned to encase the tracks between 72nd and 121st streets in an artificial tunnel.

This unusual structure will be composed of steel rigid frame bents, sheathed in concrete slab and walls. Between 121st and 98th streets, a rigid frame type of structure is being built. The bents have a clear span of 66 feet, and are placed on 17 foot centers along the track. A traveler, which will be set up on this steel, will move south, erecting the bents and floor steel. Below 98th street, the structure will be made with continuous retaining walls spanned by heavy steel girders. It was advisable to use the rigid frame structure between 121st and 98th streets because this type places smaller loads on its foundation. The completed tunnel will be covered with loose earth and landscaped.

Electronic Multiplier

Few engineers will challenge the statement that electronics is today the most active branch of electrical engineering. The extraordinary activity in this field is due to industries, like radio and sound movies, that are completely dependent upon the vacuum tube. There are few men in science who will venture to state that an electron is either a wave, particle or wavicle, let alone say what it looks like.

When a single free electron is directed at high speed toward a surface of cesium-oxide silver, its impact is sufficient to blast from the surface as many as ten other electrons. Hence, where once flew a single electron, ten others appear to take its place. This process has been given the name of "electronic multiplication"; it is one of the most direct methods of increasing the strength of an electric current ever devised.

In its simplest form, the tube consists of an evacuated shell containing two sets of flat metal plates coated with cesium-oxide silver. The plates are arranged in two parallel planes facing one another, and staggered so that an electron can bound back and forth between the two sets of plates, hitting each plate successively. The original electron is obtained by the action of a beam of light on the first plate, which is photosensitive, and, therefore, frees electrons when illuminated. The first electron is attracted

—Courtesy Technology Review.

Electronic Multiplier

to the next plate in order, because of the positive charge placed on it by an external battery. Hitting this plate, the electron frees an average of five secondary electrons. This bounding back and forth, from plate to plate, continues for ten steps, producing at the last stage 1,953,125 electrons for each original electron.

This type of vacuum tube has found a use in the reproduction of the sound track for motion picture films. The modulated light beam from a sound track falls upon the first plate. The electron current leaving the last plate is fed to a loud speaker where it delivers enough sound to fill an auditorium capable of seating 2,000 people.

—Courtesy Engineering News-Record

Artificial Tunnel Over New York Central Railway

—*Courtesy Western Construction News.*

Three-Hinged Wood Arch Bridge

Timber Bridge of Three Hinged Areh Type

An unusual type of bridge has recently been erected over Trout Creek by the U. S. Forest Service. Trout Creek is about ten miles north of Cassson, Washington. The bridge was designed by the engineering section of Region 6 of the Portland Forest Service, under the direction of R. W. Lincoln. It is the first one of its type in this country and was opened to traffic last May.

The bridge is a pre-fabricated three-hinged arch structure using steel split-ring connectors in all truss connections. The main arch has a span of 113 feet and a rise of 15 feet; it is designed for the state highway official standard of H-15 loading. The deck provides an 18 foot two lane roadway and a $3\frac{1}{2}$ foot sidewalk on the upstream side. The lanes are separated by a beveled-edge timber, bolted along the center of the deck. Beneath the sidewalk, a six inch water main is carried across the bridge in an enclosed box.

Fabrication and creosoting was done at the Forest Products Treating Company's plant in Oregon. Each half-truss was completely laid out and fully assembled at this plant before the separate parts were transported by trucks to the bridge site. There, unskilled C. C. C. laborers had no difficulty in assembling and erecting the structure. Each piece was match-marked so identity was easily established and field erection could be made in accordance with the layout in the initial fabrication. It was important to connect corresponding pieces as the truss members were not interchangeable.

Ring connected timber structures have been used extensively throughout Europe for many years, but only recently has this type of construction been used in the United States. With this type of construction a greater diversity of design may be obtained, such as the use of timber suspension bridges and various types of arches. The rings are set in a groove, routed out in the adjoining faces of the truss members; when the truss members are bolted together with the rings embedded around the bolts, stresses are developed similar to those in steel truss members.

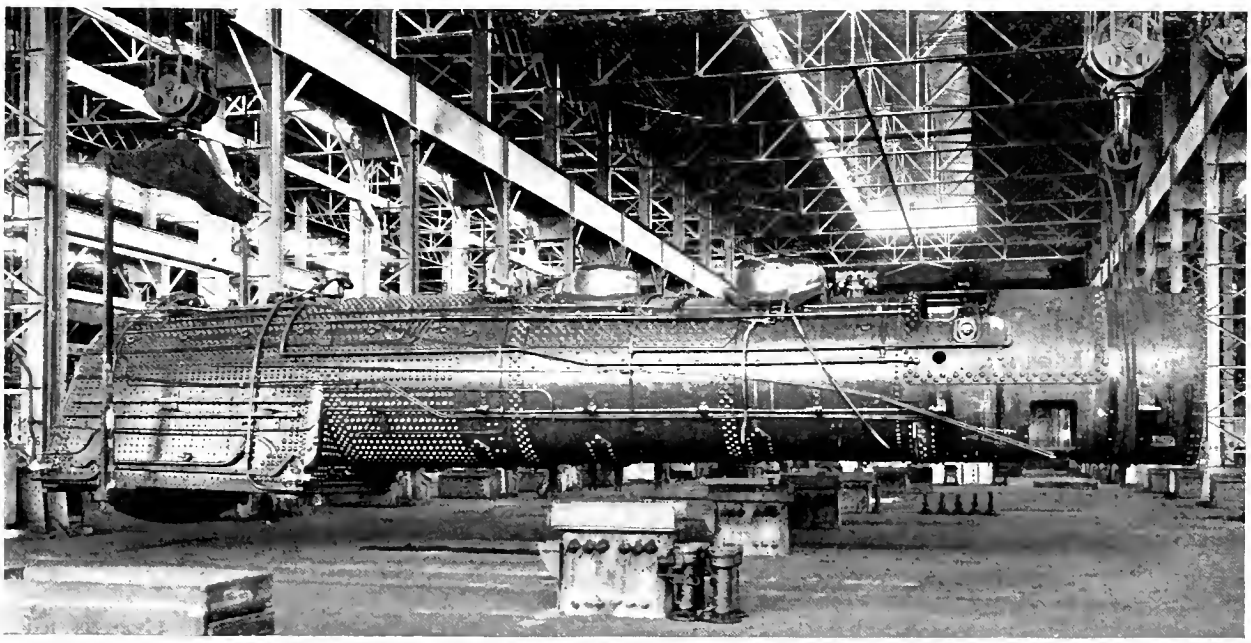
The bridge was erected on pile falsework and was assembled in place, and when the arches were closed the trusses were swung free. After completion the bridge was tested by two fifteen ton tractors and carefully measured deflection of only $\frac{1}{4}$ inch resulted.

—*Courtesy General Electric Review.*

Sodium Lighted Highway

Longest Stretch

Continuing our policy of the longest —we present the longest stretch of sodium lighted highway in the world at the present time. The highway is Route 7 leading into the city of Schenectady, N. Y., and is 18 miles long. To date, Schenectady has about 60 miles of sodium-lighted highways.



—*Courtesy Baldwin Locomotives.*

Boiler and Firebox for Northern Pacific 4-8-4 Locomotive, Built 1931. Length Overall 53 feet, 7 inches

A Woman Speaks —

HARKEN ye fairer ones who have that deep interest in engineers! What is your ideal? No, he need not be a perfect thirty-six—oh, a good stature, strong build, and a million dollar smile do help—but the ideal is more than a handsome hero.

The ideal engineer must be intelligent, ambitious, and industrious. By intelligent I mean capable of reasoning and of learning through experience; by ambitious, eager for advancement with a determination to succeed; by industrious, hard-working. He should be afraid of no kind of work. He must live within his income and save, whether a great or small amount, for the future. He must be refined and cultured in that he will enjoy fine literature, philosophy, art, music, and religion. He should be broad-minded in all of his views and ever ready to grow as times change. His character must be unreproachably strong. He must be honest, first with himself, and then with others. He will be a man of finesse and vision.

An article entitled, An Engineer's Ideal, which appeared in the December issue of THE TECHNOGRAPH contains these statements: "Selfishness is to play a dominating role in our modern world. Selfishness is unknown to the Creator. Selfishness and personal gain did not build the San Francisco Bay Bridge. Unselfishness of attitude erected it." The engineer usually is unselfish as far as his work is concerned; he does think of "the greatest good for the greatest number," but along with his vital interest in his work must come a sharing of this interest with his wife and family. He should not feel that he is a Royal Highness at whose feet all for whom he provides must bow, but he must be a steadfast friend toward whom a woman may look for high spiritual companionship. He should hold womanhood on a high level. He must see that his "ideal woman" is ever placing his success foremost by keeping her eyes fastened to his goal; that she is proud of his achievements; and that she, too, gives the moral and spiritual support which is essential to happiness.

Engineers, here is your great opportunity! Remember that cooperation is a keyword to success and happiness with your mate. Be her ideal engineer, and she, in turn, will be your ideal woman. —E. S.

Greater Than All the Available Radium

Announcement of a new X-ray generator was recently made by Dr. Richard Dresser. The new machine was designed by Professor John C. Trump of Technology and will soon be at the Huntington hospital.

This new tool of medical science is an electrostatic generator capable of producing penetrating short-wave X-rays at a potential of one million volts, for use in medical research and in the treatment of malignant diseases.

It has two distinct advantages over existing equipment: First, it will make possible the treatment of deep-seated malignancy, because high-voltage X-rays have greater penetrability than low-voltage rays. Second, high-voltage X-rays are more specific in their action on diseased tissue. In this respect the effect of the high-voltage X-rays are similar to those of the gamma rays of radium; however, the new generator will be able to produce a greater intensity of these rays than the combined output of all the available radium in the world. The potential can be regulated from two hundred thousand to one million volts.

The total power is around fifteen kilowatts—small compared to other types of high voltage X-rays. Thus, with the target at ground potential, it is possible to treat patients with complete safety at very short distances.

The X-ray tube is made of twenty porcelain sections, totaling ten feet in length, with a diaphragm between sections in order to focus the stream of electrons. The filament is so arranged that its replacement will cause only a short interruption in service.

—Courtesy Technology Review.

Capable of Producing Potential of 1,000,000 Volts

WESTINGHOUSE
ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.

W

April 8, 1935

Mr. E. S. Perrine
University Book Store
202 S. Mathews Street
Urbana, Illinois

Dear Mr. Perrine:

I have received your letter of April 3, asking for my opinion of slide-rules for design engineers and I am very glad to give you a short letter.

The practicing engineer could not get along without the slide-rule as it is one of his most useful tools. There are a few unusual men, like B. G. Lamme, who never used a slide-rule because he could work out everything in his head by mental arithmetic; for example, he memorized the multiplication tables way beyond the usual 12 x 12 limit of the ordinary school.

But for most engineers the slide-rule becomes second nature. There is a story here, which is probably untrue, that Frank Conrad, our Assistant Chief Engineer, was explaining some problem for a group of engineers at a blackboard and had occasion to multiply 2 x 2. Unconsciously he took his slide-rule, moved it around a bit, and murmured "2 x 2 is 3.99," and put this result on the blackboard. Whether this story is true or not, it illustrates how unconsciously an engineer uses his slide-rule even though, like everything else, it has its limitations and its proper place.

Yours sincerely,

F. D. Newbury

F. D. Newbury
General Manager
Machinery Engineering

FDN:EB

SOMETHING to

AMID THE hurry and scurry of our daily routine it sometimes dawns upon us that after graduation from college we are supposed to be more or less ready to make our own way in the world. At such moments we wonder if college is giving us as much as it could. By the time we get part of our lessons done, attend classes, eat, and get enough sleep to keep us awake in at least half of our classes, there is very little time left to think about such things as the quality of our college. Whether you are enrolled in the University of Illinois or not, you should recognize the value and the importance of pausing at intervals in your regular routine and taking stock of your activities, both present and future.

Is the college you are in, or the college you have considered entering, able to give you the best possible training for your life work, or have you chosen that school only because of the conveniences it affords? A pitfall that one should avoid is judging the value of a school by its cost, that is, the higher the cost, the better the school. When we realize that in the case of state universities the state pays for most of one's education, we can readily see the fallacy of such reasoning.

It is now time to ask ourselves this pertinent question: What has the University of Illinois, and, in particular, the College of Engineering, to offer, so as to merit our choice as our Alma Mater? That question I shall try to answer.

A little background is always good, and a brief history will give us that information. The College of Engineering was organized at the University in 1870, and within a year definite four-year curricula were established in Architecture, Civil Engineering, Mechanical Engineering, and Mining Engineering. In 1892 three new curricula were added, namely, Electrical, Municipal and Sanitary, and Architectural Engineering. During the years that followed, other curricula were added to from time to time until in 1933, in addition to those already mentioned, the College offered the following: Railway Engineering, Ceramics, Ceramic Engineering, General Engineering, Engineering Physics, Agricultural Engineering, and Metallurgical Engineering.

The early years of the college were characterized by steady growth, both in enrollment and in the development of means and methods of effective instruction. This steady increase in enrollment reached its peak in 1909 with 1,300 students. Following a period of 10 years, during which unusual conditions brought about by the World war caused great fluctuations in the enrollment, growth again became steady until an all-time high of about 2,000 students was reached in 1930.

It is of considerable significance that in offering jobs to college graduates, the University of Illinois is shown preference by a great number of engineering concerns. For many years the Civil Engineering Department of the college has been rated by most authorities as the most outstanding C. E. school in the country, and the Department of Mechanical Engineering has a world-wide reputation, especially in connection with heating and ventilating. The College of Engineering has also been accredited as having one of the most complete Ceramic departments in the world. Without exception, every department in the college is given first class rating by professional men. In the rest of this article, I shall attempt to point out why the University of Illinois is given such high rank.

THINK ABOUT

In the first place, it is important that a school have sufficient facilities for teaching the proffered courses, for usually the available equipment means the difference between a worthless, too-theoretical education and a practical engineering training. One of the newest buildings on the engineering campus, and one which the University has a genuine right to feel proud of, is the Materials Testing Laboratory that contains many of the Civil Engineering laboratories and all of the laboratories of the Department of Theoretical and Applied Mechanics. Located in the main bay of this building is the huge 3,000,000 pound testing machine, used in testing the strength of building materials. In the differ- bituminous laboratories, the soils laboratory, sanitary ent wings of the building are the bituminous and non- laboratory, and the cement and concrete laboratory.

In the several buildings used by the Department of Electrical Engineering are located the dynamo laboratories, the calibration laboratory, the radio laboratory, the electronics laboratory, the communication laboratory, the meter laboratory, and the research laboratories.

The laboratory facilities of the Department of Mechanical Engineering, not including the design and computation facilities, consist of two main units adjacent to the steam and electric power-generating plants of the University. One is the Mechanical Engineering laboratory, the other the Shop laboratories. The former houses the steam power, internal-combustion engine, fuel-testing, heating, ventilating, air-conditioning, and refrigerating equipment. The Shop laboratories contain the pattern and foundry laboratories, machine laboratory, and the heat treatment laboratory.

Formerly, all the laboratories connected with Mining and Metallurgical Engineering were housed in the Mining laboratory, but since the completion of the new Metallurgical building last fall, a large amount of the work has been moved into it.

The laboratory facilities of the Department of Ceramic Engineering and Ceramics include the following: the general ceramic laboratories, a separate laboratory for pottery, enamels, structural clay products, microscopy, and drying; a kiln laboratory; research laboratories; a museum; and a library.

I have tried to give you some idea of the facilities that the college has for teaching its courses. During the 65 years of its existence, the college has been able to build up its facilities, not only for student instruction, but also for special research, until today the University of Illinois ranks high in both, the Engineering Experiment Station, the first in any college in the country, being rated as one of the best in the nation.

The second reason for the outstanding rating of the college is the fine personnel the school has had ever since its founding, when Stillman W. Robinson, who was perhaps the most outstanding educator in Engineering fields at that time, was first head of the Mechanical Engineering Department. Professor A. N. Talbot, who retired from teaching several years ago, although he still maintains an office in the Materials Testing laboratory and is interested in the activities of the various research departments, was recently awarded the John Fritz gold medal, considered by American Engineers the highest award attainable by members of their profession.

Although many men could be named who have taught in the College of Engineering and who were famed in

their respective fields, we must hasten on to those who affect the immediate life of a student in the college today; those men who, because of their proficiency in their particular fields, are able to instruct students "in the finer points." Because of lack of space, it will be necessary to name only a few.

In Civil Engineering there are such men as Professors W. C. Huntington, Thomas Shedd, J. S. Crandell, H. E. Babbitt, and numbers of others well known in their fields. The M. E. department can boast of such men as Professors O. D. Leutwiler, C. H. Casburg, and H. J. Macintire. A few of the many other outstanding professors are E. B. Paine, in Electrical Engineering, C. W. Parmelee, in Ceramic Engineering, and F. B. Seely, in Theoretical and Applied Mechanics.

The final test of any school is to take a look at the records of the men who have graduated from the institution. I wish there were room to print the whole list of the graduates listed in the history of the University of Illinois College of Engineering, for no finer tribute could be paid to a school than this list of men. Here are a few of the earlier graduates picked at random from this list: J. A. Ockerson, C. E. '73, chief engineer of the United States Mississippi River commission for 20 years, and president of the American Society of Civil Engineers in 1912; Lincoln Bush, C. E. '88, famed railway engineer since the beginning of the present century, formerly director, treasurer, and vice president of the American Society of Civil Engineers; and William L. Abbott, M. E. '84, chief operating engineer of the Commonwealth Edison company for nearly three decades. Such a list could be extended for pages.

Again I repeat, what better tribute could be paid to a school than such a record of graduates?—T.M.

The Largest Construction Job

Boulder Dam, rising 725 feet from its base to its crest, has created the largest man-made lake in existence, but a still greater engineering marvel will be the Colorado river aqueduct, which will carry a billion gallons of water from Arizona to southern California. This job is costing $220,000,000, and, at the present time, has 8,000 men working on it.

At the diversion site along the Colorado river, Parker Dam is being constructed to supply the water for the aqueduct. This dam is of the concrete arch type and it is from here that the water will be pumped into the aqueduct, while four other pumping plants along the route will force it along its 250 mile path. For the first lift it will be necessary to pump it to a height of 1,340 feet, the maximum lift on the route, while the pumping stations together will lift the water to an aggregate of 1,617 feet at an operating cost of $5,000,000 per month.

Almost 100 miles of damp, rock 18-foot tunnels are being punched to carry the water through the mountains. Where rock structures are porous and rotten, giant steel forms will "shore" up the walls to protect the workmen; approximately 12,000 tons of structural steel will be in this type of support alone. Steel will be used in the open for reinforcing the structural backbone, as well as for the construction of siphons, transition sections, pumping plant buildings, etc. One can easily see the part that steel will have in this immense project.

In 1939 the people of southern California will be assured of a water supply of one billion gallons per day, that will come to them from across deserts and through mountains to the 40-square mile reservoir in southern California.

Engineers on

WHEN I finished school a year ago in Febraury, there were not many companies looking for graduates. Having nothing better to do, I went home and sat around for awhile. Later, hearing that the state was planning on employing a number of engineers in the spring, and having always envied the engineers when I was working on the roads, I put in an application and went to work the first of May. My first job was an inspector on a small paving job. Later I was on a bridge job, which was a very interesting job, and since the middle of January this year I have been out on survey as instrument man. Believe me, it is cold work running a transit in zero weather with a foot of snow on the ground.

You fellows that sit at a desk or drafting table all day long don't know what it is to be cold. It is rather a tough job, being out in all kinds of weather and always moving into a strange town, often not knowing a soul when you alight, but in spite of that it's a rather fascinating life and so far I've turned down every offer of another job that I've had. There is a certain degree of satisfaction in being in charge of men who formerly gave you orders, proving the value of education in one way at least, if not from a financial point of view.

M. B. CORLEW,
Highland, Illinois.

WALT has asked me to "Shell" out news for the first edition recording the conquests of the Invincible Class of '35 in their first attach with Industry. Here 'tis.

In the above I have already given you an inkling as to where I have cast my anchor. To be sure, I've located with Shell Petroleum Corporation and all I do is sleep, eat, and drink "Shell." For the present I'm working in the Northern Division Sales Office here in Chicago. I'm working as a clerk in the Lubrication Department trying to absorb the policies of the company and a knowledge of oils. One of my duties is to write letters to the sales engineers out in the field. I dictate daily to a dumb stenographer. However, she's not the kind you'd care to take out cause it isn't any fun to hold a dictaphone in your arms. Later after I have become "oil minded," I will be given a chance to contact Industry in the capacity of Lubrication Sales Engineer. Then watch Shell stock take a rise. Just before I take over this capacity I'll tip you off so that you can profit along with us when the ole stock booms. Of course, I wouldn't suggest that any of you play the stock market except on a sure thing like this.

As to any other news about myself, I know of very little else that I can tell except that I'm still single and I was going to say "happy" but maybe some of these recently married young warriors or is that spelled "worriers" might frown on such a comment. Anyway since I'm still single and intend to stay that way 'til some gal asks for my hand....

NORM BROWN,
Chicago, Illinois.

THIS letter almost puts me in mind of a M. E. report. That was something I knew I had to write but always put it off till the last minute—just like this letter.

As you probably know I am working for General Motors, but to be more explicit, I am employed in the Special Problems Department of the General Motors Research Laboratory. Most of the work done in this department is on static, dynamis, and harmonic balaneing of everything imaginable. However my job is of a little defferent nature. Another young engineer—a Michigan graduate in E. E.—and myself are working along with C. F. Kettering on a pet bit of research of his. You no doubt heard of Mr. Kettering—one of the most brilliant experimental engineers and scientists of this mechanical age. He is one of the most interesting talkers I have ever known and a wonderful person to work for. I can't give you the exact details of what we are doing because in a competitive company like G. M. we are sort of put on our honor not to talk shop. I think you will understand what I mean.

The work is more of an electrical nature rather than mechanical and what I have been doing most of the summer is designing new apparatus, building it—that is the part I

the Loose

like best—taking data, drawing curves and analyzing the curves. We ran into some nice calculus last week getting an equation for the energy stored in a toroid coil of any size with any number of layers of wire, of any size wire. At present I am building a little machine for winding toroids which we use in our work.

AL FISCHER,
Detroit, Michigan.

WELL your last letter has been put into shape for the printer and now its my turn to take a crack back at you in one big editor's note.

As you know, yours truly gravitated towards New York City to give Columbia university a break and to let them get wise to some of the things that are going on in the world's greatest University—Illinois. Well last summer one midnight, I stepped out of a station into that world's busiest corner—Times Square. Gee what a sight. Broadway and its myriad of colored lights advertises its theaters in one direction and Seventh Avenue and 42nd Street run a close second with the burlesques and other night life. For a moment, I didn't know which way to turn, but a neon sign pointed out a hotel, a welcome sight. Weeks have passed since then and I now feel that I know this city like a book.

My teaching experience has been confined to the mechanical engineering laboratory and to the machine shop courses. My first two hour lecture on machine toools was a thrilling experience, I assure you. For the second semester's work, instead of shop practice, I have laid out a series of laboratory experiments in shop work along the lines of research and my students have gotten some fairly good results on even make-shift apparatus. This summer, I plan to build other and better apparatus to improve the course for next year. Columbia has given me unusual liberty with their money in building apparatus, etc., and the other day a notice came around that the budget for the rest of the year was MT, whereas in other years all of their budget was never before spent. The only trouble is that I spend my salary equally as fast here in New York. One week of the month I am a capitalist and the other three I am a bolshevist or what ever those thing are.

I spent several days in Urbana during the Christmas vacation visiting friends and several members of the faculty, amongst whom was Prof. Leutwiler, of course. The department is managing to struggle along, but I understand that the class of '36 is coming nowhere near the standards set by their predecessors. Yes sir boys, we have one real bunch of fellows in our class who are not only a damn good bunch of fellows, but are also damn good engineers as well. Watch our smoke just as soon as we get a good hold on the wheels.

Ye Olde Editor,
"WALT" JOHNSON,
New York City, N. Y.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912.

Of The Illinois Technograph published four times a year (Sept., Dec., Feb., April) at Urbana, Illinois for February, 1937.

State of Illinois
County of Champaign
ss.

Before me, a notary public in and for the State and County aforesaid, personally appeared Walter A. Renner, who, having been duly sworn according to law, deposes and says that he is the business manager of The Illinois Technograph and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management and the circulation, etc., of the aforesaid publication, for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations.

That the names and addresses of the publisher, editor, and business manager are: Publisher, Illini Publishing Company, University Station, Urbana, Illinois:

Editor, Robert Zaborowski, Urbana, Illinois.

Business Manager, Walter A. Renner, Urbana, Illinois.

That the owner is The Illini Publishing Company, a non-commercial organization whose directors are W. E. Britton, O. A. Leutwiler, F. H. Turner, Delores Nagoda, Jack R. Grimm, John O'Byrne, F. S. Siebert, Alice Hudelson.

WALTER A. RENNER, Business Manager.

Sworn to and subscribed before me this 8th day of October, 1936.
(SEAL)

MARGARET E. WALSH,
Notary Public.

• TECKNOKRAKS •

Lou Shiff: "Do you think there is such a thing as a really good hair tonic?"

Barber: "Yeah, I know one or two that are all right if you add a little lemon juice."

* * *

Atkinson: "I know you did not read this report and yet you hand it back for correction. I stuck pages five and six together and I see that they are still that way."

Prof. Babbitt: "At breakfast when I open an egg I don't have to eat the whole egg to discover that it's bad."

* * *

Sadik (arrested for speeding): "But, Your Honor, I am a college boy."

Judge: "Ignorance does not excuse anybody."

* * *

They had been sitting in the swing in the moonlight, alone. No word broke the stillness for half an hour, until—

"Suppose you had money," she said. "What would you do?"

He threw out his chest in all the glory of young manhood: "I'd travel."

He felt her warm, young hand slide into his. When he looked up, she had gone.

In his hand was a nickel.

* * *

She: "I ought to leave you and go home to mother."

He (angrily): "Well, why don't you?"

She: "I can't. She's left father and is coming here."

* * *

The girl who's a live wire when it comes to dancing is always exposed.

* * *

Co-ed: "I want you to tattoo a cat on my knee."

Tattooer: "Nope, a giraffe or nothing."

A wealthy client insured her valuable wardrobe while traveling in Europe. Upon reaching Paris she found an article missing and immediately cabled her broker in New York: "Gown lifted in Paris." Her broker replied, after due deliberation: "What do you think our policy covers?"

* * *

'Twas midnight in the parlor,
'Twas darkness everywhere;
The silence was unbroken—
There was nobody there.

* * *

A colored man doing a hauling job was informed that he could not get his money until he submitted a statement. After much meditation, he evolved the following bill: "Three comes and three goes at four bits a went—$3.

* * *

A married couple were sleeping peacefully when the wife suddenly shouted out in her sleep: "Good Lord, my husband!"

The husband, waking suddenly, jumped out of the window.

* * *

"Are you going to take this lying down?" boomed the candidate.

"Of course not," said a voice from the rear of the hall, "the shorthand reporters are doing that."

* * *

The slogan for a nice night's entertainment: So-fa and no-father.

* * *

McCarthy: "Did you protest against the movie that represents the Irish as being disorderly?"

Murphy: "Did we? We wrecked the place."

* * *

"Where is the little cocktail shaker this year?"

"Oh, she transferred to another school."

* * *

Schoeppel (translating a passage in German): "I fell to the ground, humble, alas, and clasped her by the knee—and that's as far as I got, professor."

* * *

"Mister, if you think you can kiss me like that again, I'll have something to say about it."

"Well, I'm going to, so start talking."

"The electric light switch is right next to the piano."

* * *

PALS

Krivo: "A vaudeville manager offered me $5,000 a week if I'd make personal appearances, but I declined."

Berman: "Yes, why risk your life for that little?"

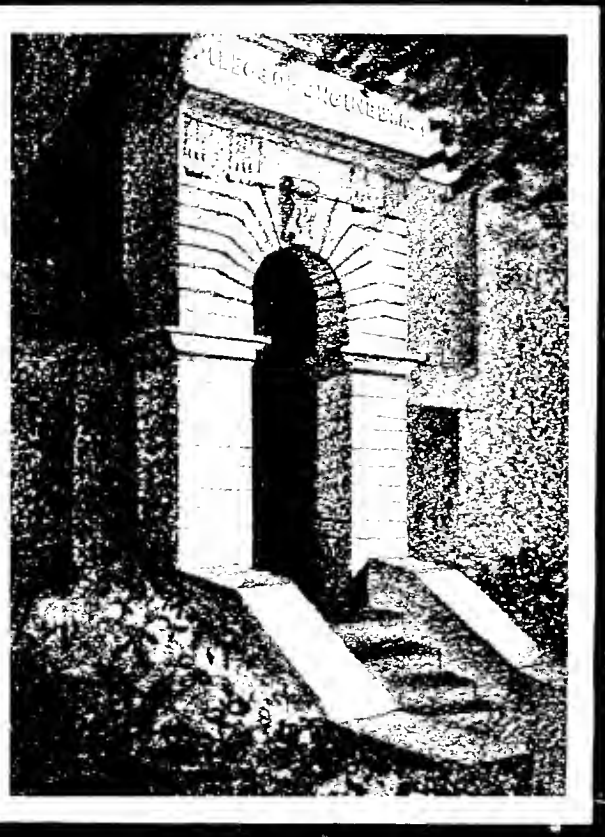
* * *

"Certainly I respect your legal advice, Mr. Bell, but what good is alimony on a cold night?"

* * *

The Human Race—the only race which is never over and which no one ever won. Each succeeding generation is a new relay. They travel 'round nature's course neck and neck and usually end up tied!

THE ILLINOIS TECHNOGRAPH



MEMBER OF E. C. M. A.

Checkmates Corrosion

Welding aids modern metallurgy to produce completely corrosion-proof assemblies

EQUIPMENT is subject to corrosive attack and consequent deterioration by three forces: chemical attack, electrolysis and erosion. Chemically active gases, liquids, pastes, or solids eat away the more easily attacked portion. Dissimilar metals often set up galvanic currents, which cause pitting and corrosion. High-velocity steam or solid particles in a slurry add mechanical abrasion to the ravages of chemical and galvanic attack.

Welding Prevents Deterioration

Welding is a valuable aid to users and fabricators of equipment for corrosive service. By welding, equipment can be made smooth, jointless—one-piece. Valves and necessary fittings can be faced with corrosion-resistant metal welded in place. Chemical attack can be further prevented by making welds of material similar to the body metal.

Welded assemblies present a smooth, unbroken internal surface. No pockets are formed in which concentration and consequent deterioration can occur.

Galvanic attack, which occurs with other types of assembly, ceases to be a factor in welded equipment. In a welded assembly, the same or similar metals are fused together. Perfect electrical contact prevents the damage due to galvanic action. Abrasion by steam, water, or solids is prevented by welding on hard alloys at constrictions and bends.

Welding Stops Corrosion Losses

Abrasion, chemical attack, electrolysis, are defeated on a thousand fronts by welding. New equipment, designed to resist corrosive conditions and fabricated by welding to assure satisfactory performance, is achieving enviable records in service. Equipment which would otherwise be scrapped is renovated and protected against further deterioration. Many corrosion problems, localized in extent, are conquered through the application of resistant materials to the affected parts by welding.

As a result of the successful application of welding to check corrosion losses, industry is saving money. Repair and replacement bills are cut. New machinery and supplies have a longer life, and thus amortization charges are lowered. Less valuable production time is lost through shutdown and accident.

A few of the many ways by which welding checkmates corrosion, selected from actual case histories, appear in the column at the right. These and many other similar welding applications may be utilized in your future business.

THIS ALL-WELDED KITCHEN UNIT includes sink, dishwasher, drainboard, working space, and closets. It is made of stainless steel, welded into a jointless unit which is strong, easy to clean, and resistant to corrosion. Many of the utensils also are of stainless steel.

Welding Savings

In the textile industry, stainless steel is used for dye-vats, tanks, buckets, dippers, and many other purposes. The equipment, welded throughout, resists chemical action, is smooth inside and therefore easily cleaned, and is strong and durable.

* * *

Wear by sandy water had pitted the surfaces of two 42-inch diameter balance needle valves so seriously that the valves would no longer operate efficiently. Twenty-two hours of welding saved these expensive semi-steel castings, which otherwise would have been scrapped.

* * *

In redesigning several 700-gallon tanks for food storage, it was necessary to eliminate an unsanitary and corrosion-ridden condition. The tanks were redesigned to be made from stainless steel with welded joints. The inside and outside are now permanently free from undesirable laps where germs might lodge or corrosion might start.

* * *

Sea water had seriously corroded the impellers of cargo pumps on an oil tanker. Five hours of welding repaired this damage at a fraction of the cost of new parts. Resistant metal used for the repair will prevent recurrence of trouble.

* * *

Welded piping in the floor of a skating rink successfully resists severe corrosion in addition to mechanical stress. No mechanical joint could withstand this service. The piping carries alternately refrigerating brine for freezing the skating surface and steam for melting it.

* * *

Milk storage tanks for a chocolate manufacturer were welded to prevent corrosion and unsanitary conditions. These tanks were fabricated entirely of stainless steel. They were welded to prevent corrosion at the seams as well as off-taste in the milk. The smooth, flush, inside surface left no pockets for chemical and bacterial action to produce spoilage.

* * *

A container for caustic soda solutions, made of Monel metal to resist corrosion, had a cast iron plug in the base. Corrosion troubles were imminent. By welding this and all other joints, corrosion was successfully prevented.

* * *

Tomorrow's engineers will be expected to know how to take advantage of this modern metalworking process. Many valuable booklets describing the oxy-acetylene process are available without obligation. For further information write any Linde office.

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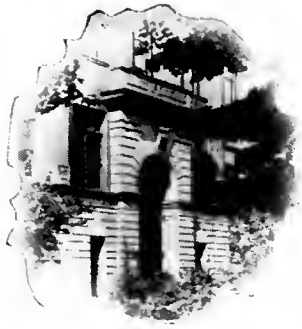

THE ILLINOIS TECHNOGRAPH

UNIVERSITY OF ILLINOIS

Established in 1885

APRIL, 1937

Volume 51 Number 4

TAKE YOUR ease, gentlemen, and hark to the words of wisdom uttered by our own inimitable Captain Matthews as he leaves his parting words to befog our vision and cover his retreat from our barracks. The fifty-minute sessions of B. S. are almost over.

● It is with much regret that we have bid goodbye to our one and only Hardy Cross. For 16 years, Illinois has had the privilege of this man's unassuming and clear thinking mind. The Technograph, long one of his interests, presents a part-picture of this great man.

● Jobs are foremost in the thoughts of many as the semester draws to a close. Take some hints and be "choosey" after reading "And Now What?"

● FRONTISPIECE: *(Courtesy Architectural Forum)* Rockefeller Apartments, a modern, well-lighted and well-ventilated apartment house, financed by Mr. Rockefeller. They are rented by wealthy New York commuters.

Contents

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THE ILLINOIS TECHNOGRAPH

Published Quarterly by the Students of the College of Engineering, University of Illinois

Volume LI | APRIL, 1937 | Number 4

Engineers Play Host

Students Display Fascinating Array of Exhibits

TODAY, April seventeenth, nineteen hundred and thirty-seven, the University of Illinois campus north of Green street is overflowing with people. Sidewalks, passageways, and streets are filled with moving crowds. Thousands of persons are passing through the buildings composing the physical plant of the College of Engineering. What could be the cause of such a crowd on North Campus? There are some students, to be sure; but too many in the crowd appear to be in strange surroundings, unfamiliar halls with new noises constantly distracting their attention, for us to believe that they are all engineering students.

Usually only one thing is of sufficient interest to cause such a large number of people to be together in one place, a movie. That is exactly what is being shown, a 10 reel movie; the scene, a laboratory; and the actors, the engineering students themselves. These 10 reels of the engineering student's laboratory life will place such a multitude of scenes before your eyes that it would be impossible to describe even a good part of them in a book. Each reel covers the activities of one branch of engineering as represented by each of the departments making up the College of Engineering.

The Engineering Council, whose members are the officers of the student engineering societies, revived Open House two years ago after a four-year interval during which exhibits were not shown. With the help of many students, and the advice and assistance of the faculty, the council put on a grand show two years ago. This year's exhibit is expected to surpass the show of two years ago.

We can now pick out just a few of the many scenes to be shot. Perhaps in deference to the fact that civil engineering is probably the oldest field of engineering, having grown out from the military engineering of the ancients, we will start with a few glimpses of the interesting work of civil engineers. Models of various dams representing power and irrigation developments, financed and designed by the government, are set up in Engineering Hall. The names of many of these projects are familiar to us from newspaper accounts, and it is really interesting to see some of the working details. One field of civil engineering which is so familiar to most of us that velopment in various stages of construction can be seen in the lecture we usually do not recognize it as such is highway engineering. Results of work done at the University in connection with highway markers, visibility of license plates, and traffic movement surveys can be seen.

As part of the entertainment offered to visitors, a real movie showing progress of the Grand Coulee de-

I SEE

the

Illinois Student Engineering Exhibition

Presented April 17, 1937

by the students of the College of Engineering under the supervision of the

Engineering Council

W. D. Orr, Chairman

•

E. C. Adams	G. H. Logan
F. W. Andrew	E. G. Robbins
E. L. Cornell, Jr.	H. Taylor
F. Hummel	R. Tonning, Jr.
R. A. Kempf	R. Zaborowski

and the guidance of Dean M. L. Enger assisted by the faculty of which Professor J. J. Doland is General Chairman.

room of the Electrical Engineering building. It may also be mentioned here that a skit written by two prominent faculty men and enacted by students is shown alternately with the movies.

The next scenes will be clipped from the reel covering the activities of the mining and metallurgical engineers. These students are especially lucky in having a new laboratory, with new equipment being installed as fast as possible to aid them in their work. Industrial processes through which our common metals have to pass before they are ready for the fabricator are being demonstrated on a laboratory scale. Models showing mine construction and operation, pieces of mining equipment, crushers, stamping mills, flotation process equipment, and fire assaying methods are a part of this fascinating reel. In general, the mining demonstration covers the work of treating the ore before it reaches the reducing furnaces. Metallurgical control of the operations necessary to produce the final product, the casting, are being explained and illustrated with the aid of microscopes, treating furnaces, and test castings.

Our next pictures will be taken from the trip through the ceramics department. There we are not entirely limited to pictures, for the students have prepared a useful souvenir in the form of a U. of I. monogrammed and enameled ash tray. Automatic brick making machines show the mass production of bricks that permits our cheaper and better built houses and shops. The ceramist demonstrates his art in preparing the clay and treating it in the kilns to obtain desired properties. Potter's wheels show the hand shaping of beautiful pieces of pottery. The ceramics research laboratories carry out studies on glass and its properties, so that various types may be developed to meet the demands of its many uses. An integral part of the exhibit is the picture showing enamels.

Perhaps the students who act on our next set are just carrying out an often recurring boyhood ambition to play with trains, but being trained as engineers, the railway students go into many details of railroad operation. The locomotive testing laboratory attracts much interest because an actual engine is being given a run test without its moving an inch. One of the technical problems which railway engineers have worked on is the balancing of locomotive drive wheels in an effort to decrease the "nosing" of locomotives that disturbs the speed and smoothness of your ride. A model used to do the balancing is on display. Apparatus used in the testing of brake shoes, as well as results of some of the tests, appears interesting. Models of signals and automatic blocks, as well as a few full-size pieces of signalling apparatus help explain how train movements are controlled.

Our next films are concerned with pictures. Here we see the results of the General Engineering department's efforts to train the student to put the ideas in his head on paper where others may look at them. The latest time-saving drafting equipment, the many methods of reproducing original draw-

ings, and special equipment used in various types of drafting work are on display.

M. E.'s Exhibit Air Conditioning Unit

The next succession of acts appear on the Mechanical Engineering set. Various types of engines run by the students will be in operation or the floor. Here we see and hear steam, diesel, gas, and auto engines. One piece of equipment drawing much attention to its results is the new air conditioning unit installed on the south side of the laboratory. This plant is available for both undergraduate work and the study of research problems, such as air cleaning by filtering or washing, air humidification, and precision measurements of dry and wet-bulb temperatures. One part of the exhibit on this floor should be especially interesting to people from the sections of this state where oil has been discovered. The department, in cooperation with the State Geological Survey, has exhibits illustrating the location of oil pools by scientific geological study. Pieces of drilling equipment and models illustrating operation procedure help round off this absorbing exhibit.

The shop laboratories will have students working in them just as they do in class time. In one section we find a miniature gas engine, built by the students, turning over 5,000 revolutions per minute. The heat treating laboratory has its furnaces in operation with temperatures as high as 2,400 degrees Fahrenheit. Many of us will probably get our first sight of molten iron in the foundry where castings are being poured at regular intervals. Oxyacetylene welding, one of the great aids to modern production, has its demonstration by illustrating its application to details of manufacturing fabrication problems.

3,000,000 Pound Testing Machine Operates

The Materials Testing Laboratory gives us a good many opportunities for snaps of engineering testing in action. The great 3,000,000 pound testing machine, second largest in the world, is operated every hour exerting two-thirds of its capacity on concrete test specimens. The hydraulic laboratory is being operated by students studying problems concerning pumps and piping losses. The second floor provides us with examples of tests on steel, cast iron, and timber. A feature not to be missed is the research work of the department, concentrated on the third floor, where fatigue testing is done.

The student electrical engineers put on their great show in alternate years with Open House, but almost too many interesting things now present themselves in the laboratories. The short wave transmission equipment, the talking tape, and automatic telephone exchange will contribute several scenes. In the laboratories, students are carrying out regular laboratory work on electrical equipment. Cost of common household appliances can be easily determined by a meter set up in the laboratory to read the cost directly. Since so much of our time is spent in working or playing by artificial light, the exhibition in the illuminating laboratory should be especially interesting in showing the conditions which good lighting must fulfill. Effects of glare and differences between ordinary artificial light and daylight, as well as the effects of color in lighting will be brought out.

The chemical engineers will contribute much to our film pack with a mechanical cow fed with chemicals, and delivering "milk." Liquid air experiments may at first seem dangerous but will prove harmless as long as the cannons are charged with cork and we are not asked to eat the prepared meal. A laboratory scale demonstration of the high temperature electric spark process for the fixation of nitrogen may be seen.

The agriculturally-minded will find the earliest and latest types of harvesting equipment, modern corn picking machinery, and terracing equipment on display. Methods used in the government's Soil Conservation program will be demonstrated along with the equipment used. One of the latest types of earth moving machines is included in the machinery display and explained by soil conservation engineers.

Now that we have given you this random clipping from that great feature picture, **Illinois Student Engineering Exhibition**, we urge you to complete it with a personal visit. See it for entertainment, see it for education, see it for one of any number of reasons, but be sure that you do not miss "I SEE" of 1937!

The writer is indebted to the many faculty men and students intimately concerned with the preparation of the exhibition for their co-operation in supplying information. There is little doubt that in the course of the weeks following the preparation of this article unmentioned exhibits will have been added.—M. H.

PAUL REVERE . . . . RIDES AGAIN

THE "STREAMLINE" fad has produced a myriad of undeniably smooth-looking vehicles for road, rail and air. According to their respective creators, these mechanisms are the ultimate development of scientific design, the completely successful union of power and beauty, the symbol of modern civilization—in short, the expression of perfection. But — ARE THEY?

The modern American is hardly competent to judge. Buffeted about by bus, train, and plane these many years, he greets any improvement with open arms and accepts with it the insidious propaganda that undermines his reason. If not a man of this era, who can adequately pass judgment on the transportation of today? One man in history stands out suited for this task, for he was not only a great American patriot, but is the most famous rider of all time. Ever ready to answer his country's call, he is with us now; and —PAUL REVERE RIDES AGAIN!

Our first glimpse of Mr. Revere strikes us with dismay, for those ever-watchful transportation officials have apparently already poisoned his mind. There he stands on a crowded New York street before a gaudily-painted travel bureau. His pockets bulge with brightly-colored pamphlets which scream out a succession of superlatives about modern travel. Paul is obviously impressed; but, true to his resolve, he decides to put the matter to a test.

Striding to a corner, his frock coat a-trail, he boards a low, sleek, street

—*Courtesy Scientific American*

A New Model With Each Year

car. As the smooth, powerful, motors are energized, Paul begins to realize why there has been such a scramble for the last available seat, for he finds himself curled up under the rear seat of the car, much entangled in the legs of fellow passengers. His profuse apologies are cut short, however, for Paul has scarcely doffed his hat than the smooth, powerful brakes grip the rails, and Mr. Revere finds himself whisked away to the front end of the car and hopelessly enmeshed with the much-befuddled motorman. Following the example of the other adventurers in the car, Paul grasps a shining pole and arrives at his destination without further mishap; but it is with a sigh of relief that he alights at the starting point of his next excursion—a bus stop.

A few minutes later we find him aboard a shiny new bus. As it wends its way through the city, Paul reflects that it is somewhat less abrupt than the street car, and, since he is seated this time, is rather enjoying the ride. A half hour later finds his spirit at low ebb again, for he alights at the bus terminal with an upset stomach and a headache—the combined result of stiff springs and motor fumes.

Paul Takes To Open Road

Soon he boards another sleek travel unit: a powerful, new, interstate bus, bound for Chicago. An hour later, on the open road, Paul finds that his headache has vanished, but that his stomach is even more upset. Fortunately a sympathetic traveller who has been riding near the front of the bus reaches his destination, and upon alighting, advises Paul to leave his seat in the rear of the bus and try the one further forward. Paul takes the advice and is soon feeling fit again, but he pauses to reflect that SOME ONE has to ride in the rear half of the bus.

The next evening Mr. Revere arrives in Chicago. The rest of the bus trip has been rather uneventful, except that the mighty monarch of the road is six hours late because of motor trouble in the mountains, and a blowout.

Mounts Iron Horse

After a night of well-earned rest Paul starts westward on the next leg of his inspection trip. His steed this time is nearer to his heart, for it is the iron horse, 1937 model. Just before the long, low train is due to pull out of the station, there is a slight jolt throughout its length. Paul, always inquisitive and by now a little skeptical, goes to the door and looks to the head of the train. He is indeed disillusioned, for there in front of the rounded, gleaming nose of the great streamliner is a black, panting hulk which hardly looks capable of attaining the 120 miles per hour that the travel bureau circular claims for the flyer. The conductor soon clears the matter up; he informs Paul that the mighty power units of the streamliner have not been functioning for nearly two weeks, and that the train is to be pulled by the reliable, but very commonplace, steam engine. Of course the trip to Denver is a disappointment, for the train is many hours behind schedule and whatever futuristic interior of the train furnishes is promptly dispelled by a glimpse of the laboring steam locomotive as the train rounds a curve. And as if that is not enough, the atmosphere of the car, which for some hours has been very delightful, gradually becomes humid and stale, and almost stifling. It is finally made known that the air conditioning unit is not operating.

—Courtesy Scientific American

Skimming the Tops of Mountains, Like Walking In Seven League Boots

It is a rather embittered Mr. Revere who boards a modern giant of the airways at the Denver airport. Once in the air, he notes that the flight is rapid and pleasant, aside from a little noise and rather limited space in the cabin; but he is not surprised when the great bird is forced to land by a bad storm, after being tossed around in the heavens for some moments before finding an emergency field.

Paul learns later that the preceding plane, caught in the mountains, had crashed. Indeed, he reflects, this trip leaves little to be said for modern transportation. However, he very fairly concludes that he has been the victim of an unusual chain of events and decides to travel more extensively before rendering his decision on modern transportation. Here we shall leave the presence of the great patriot. Suffice it to say that in the course of his journeys he had many fine trips on land and in the air, but in his epochal best seller, "Ye Impressions of Travel, A. D., 1937," Mr. Revere has taken into account the imperfections of that first journey. Here are Paul's final words on the matter: "The day of the horse is gone forever. The transportation of today is wonderful in many respects, and is worthy of much praise. It is not perfect! The men who have brought it to its present state of development must not rest on their laurels, but must continue to improve and develop this field, which is so vital to the advancement of a civilization."

—R.C.A.P.

PARADE REST! . . .

The Last Chapter of the Cap'n's Ramblings

EDITOR'S NOTE: *After very successfully completing five years of work on campus, Capt. Matthews will be leaving us in June to report for duty elsewhere. He has given in the following article a few pertinent bits of last minute advice to his younger "partners in crime."*

•

THE UNDERGRADUATE student of engineering necessarily and traditionally pursues a curriculum principally concerned with the discovery, elucidation and inculcation of methods of engineering design and research. The embryo engineer learns, we hope, why engines function, motors turn, and bridges stand up. He lulls himself to sleep with thermo and tries differential equations on his girl problems. To the immense relief of the faculty and family, he eventually graduates and departs from the cloisters, whence he goes busting out to face his first job, much impressed by his own great knowledge.

On the job, he is confronted not by the old familiar sterotyped "why's" of the classroom, but by the "how's" of actual fabrication. He learns that a gap, often unbridgeable, separates the design engineer from the superintendent of construction. He begins to sense that there may be more to engineering than the computation and drafting of a pretty design. In time he may realize that a 10,000 foot cantilever bridge on tracing cloth is after all only rather expensive raw material for paper dolls, while a 20 foot king post timber bridge is a useful physical structure, a concrete fact, and a complete accomplishment.

It is the alleged purpose of this obviously hastily assembled article to

treat very generally of these "how's" of our mutual profession. This subject was chosen on the grounds that since the editor, the readers, and the writer were all equally ignorant on this matter, the discussion would be untrammeled by annoying truths and unhampered by intrusive facts.

The efficiency of the construction of any engineering work is naturally a direct function of the abilities of the engineer in charge of construction. To do an efficient job, he must have the ability to organize, deputize and supervise; to improvise sound solutions to emergency problems, to control and coordinate the activities of his subordinates; in short, to stand up on his hind legs without braying and give a convincing imitation of a real engineer.

Why Organize?

Without being too technical, it is desired to detail some of the matters mentioned in the preceding paragraph. The organization of any job proceeds generally along the following lines. First, a simple one sentence statement of the purpose of the proposed organization, and a very brief resume of favorable and unfavorable factors are formulated. This sounds silly and is undoubtedly superfluous in some cases. However, most jobs are not uncomplicated, and such complications frequently give rise to complex and confused organization when the prime purpose of the organization has not been held clearly in view. For example, the Panama canal project was inefficiently carried on for many years by various French and American organizations. The air was filled with learned arguments concerning features of design. Finally, a clear thinking, hard-eyed, very red-necked engineer was sent on the job, who saw that it was not a question of lock level or sea level canal, earth dams or concrete dams, army or civilian control, but primarily a problem in moving half a billion cubic yards of dirt. In order to do this efficiently, three things were necessary: digging equipment, transporting equipment and men to operate these machines. In order to have men, certain epidemic diseases, which killed them off like May flies, had to be controlled. The diseases could be controlled by certain extensive draining and clearing measures, properly chargeable against the cost of the canal. These sanitary measures accomplished, the dirt came out and the canal became an accomplished and useful fact instead of a French promoter's golden sales talk to a gullible public.

Schedule of Operations

The next step in organizing the work is to plan the coordination and sequence of operations, with a schedule of completion for various items. In most cases, it is difficult to start the superstructure before the foundation has been completed, but frequently false work can go in, hoists be erected and material storage, etc., be provided during the foundation period. So the scheme of operations for any type of construction tends to become stereotyped and grooved.

With the analysis and the scheme of operations in hand, the superintendent of construction then picks his assistants and delegates to them the authority they need to handle their functions. He goes over with these assistants his scheme of operations and fixes the number and qualifications of men for each component. The balancing of these crews is often essential to the smooth progress of the job, so that the work of one crew is not delayed by reason of having to wait on another gang to complete its portion of the work. For instance, a too large riveting gang working behind a too small or inefficient erection crew would be held up because the steel would not be in place for them to rivet.

Supplies Present Difficulties

About this time, in this discussion, it is desired to point out that most painstaking effort must be taken with the arrangements for the supply, delivery, transportation, storage, and safe keeping of materials and tools of construction. Good assistants are needed everywhere, but on a big task, the best assistant is none too good for the supply job. In many instances, contractors have either forfeited entirely or paid large penalty fines solely because of the failure of their supply organization. In the high rent sections of large cities, this supply problem can become intensely complicated with heavy street traffic, distant freight terminals, the storage space inadequate on the site and prohibitive in cost in the neighborhood. In such cases, the schedule of materials needed must be carefully worked out and turned over to some good obstinate assistant, preferably Irish or Scotch, with lots of initiative and ability to get things done, with the disposition of a mule angel and the voice of a bull devil. The obstacles to be overcome, and the trials to be borne by this assistant, are many and have a habit of getting worse. Cement truck drivers get drunk or get behind a funeral, 60-ton girders get lost for days, dear old ladies object by legal processes to the language a roustabout used to express his pained surprise when a pinch bar cracked him on the shins, rivers rise in flood and wash out the construction tracks, and tides leave barges of materials stranded and aground.

Capable Assistants Vital

After the job is organized, the engineer in charge will find it difficult to run everything himself and must be prepared to deputize and supervise. To do this, he delegates authority to his principal assistants, turning over to them complete control of certain portions of the job. These assistants are held responsible for their part of the construction and should have authority to hire and fire. They should be told what to do, but not how to do it, unless such information is requested. No instructions should be issued to their subordinates except through them. They should be supported to the fullest extent by the engineer in charge. At the same time, there should be substitutes in training to take the places of these principal assistants so as to provide for replacement in case of emergencies. If an assistant proves untrustworthy, it is much better to fire him and get along with a less able but trustworthy man than to retain him and be always worried. If an assistant deems himself indispensible, fire him and train a substitute for his place.

The supervision of the job is a task requiring the major effort of the superintendent of construction. A very small portion of this supervision can be accomplished efficiently from behind a desk. The engineer in charge must be out early and late on the job, going from one point to another, principally where he has a hunch he's not wanted at the moment. He checks up on his assistants and sees that they are on the job, that they are planning their next moves, that their work is not being held up by lack of supplies, and that their efforts are coordinated. He cannot expect cooperation between two crews on portions of the work. On the other hand, it is his duty to require coordination, as that takes the place of cooperation and is much more certain of results. In his efforts to coordinate, an inexperienced man almost always makes the mistake of putting some gang, or special individual, or piece of plant under two bosses. For example, a crane operator will be working for both the erection crew and the false-work crew. Such a situation normally leads to two unfortunate results: hostility between the bosses of the two crews and slacking by the crane operator.

Competition Is Dangerous

To speed up construction, competition between crews or gangs is an excellent means, yet a dangerous one, as competitive spirit has an unfortunate habit of getting out of bounds, fostering ill feeling, shabby slapdash workmanship and downright sabotage and tragedy. Man is an egotistical animal and likes to excel his fellows, so given strong enough competition, there will always pop up an individual who wants to play with marked cards just to titillate his ego by "winning."

The above rambling discourse not only does not cover the announced subject, but gets rather dogmatic on matters which will not be of use to the average reader for some years to come. It is believed however, that engineers should be normally well qualified in three fields: design, construction, and the handling of men. Design is taught in the universities, but construction and the care and feeding of men must be learned from experience. By observing others and keeping a note book of our observations, we can acquire and render readily available for our later use, a wider range of experience than it would be possible to acquire at first hand. Such a note book should contain data on the usual construction methods and operations and description of clever or ingenious expedients and emergency measures. Considerable data on the size, output and tools of the usual crews on various construction jobs should be obtained and noted. The typical organization of various jobs should be detailed, together with the basic principles, with examples, of handling men. It is not necessary, as might be supposed, to be a graduate engineer to start the collection and collation of these suggested data, but it is true that the engineer working at his profession is much more concerned with such information.

In conclusion, the writer hopes that the above fragmentary and, at times, incoherent remarks may be of a little help to the young Illini engineer when the boss leads him to a swamp, and, looking out across miles of mud and flood, says: "Build the bridge here. Complete it tomorrow midnight!"

—A. G. MATTHEWS
Captain, C. E.

AMONG OUR SOCIETIES

Civil Engineering

THE STUDENT branch of the American Society of Civil Engineers, Chi Epsilon, and Mu-San have been keeping things humming for the C.E.'s lately. The A.S.C.E. began its second semester program with a talk by Professor J. S. Crandell, who discussed the city manager form of city government. Professor Crandell pointed out that this is an engineer's field and stated that some 65 per cent of the city managers today are engineers. On March 3 the society presented Henry Penn, an Illinois graduate who is now district manager for the American Institute of Steel Construction. In his talk entitled, "New Tricks in Structural Steel," Mr. Penn discussed modern methods of building structures pleasing to the eye. On March 10 the student chapter presented a program before the civil engineering freshmen at Engineering lecture. Seven members of the chapter presented short talks on various phases of the activities of the society, with the purpose of getting these men interested in the society early in their college course.

A.S.C.E.

President—H. E. Skinner
Vice President—F. J. Kile
Secretary—T. P. DeWan
Treasurer—H. W. Afkinson

CHI EPSILON

President—E. W. Zelnick
Vice President—M. L. Gossard
Secretary—C. J. Poppe
Treasurer—B. O. Larson
Associate Editor Transit—R. Zaborowski

MU-SAN

President—J. M. Stipp
Vice Pres. & Treasurer—H. W. Afkinson
Secretary—L. T. LeBron
Historian—R. I. Leland

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Ceramics

THE CERAMIC and ceramic engineering students, under the leadership of the Student Branch of the American Ceramic Society and Keramos, have been very active in promoting many novel features during this year. Besides holding a successful dance, the "Ceramic Ruckus," and working on exhibits for Open House, the ceramic students are also putting out a year book. At a meeting of the S.B.A.C.S., on February 18, plans were made for this year book. Also at this meeting George P. McKnight of the Porcelain Enamel Institute spoke. On March 18 the society held a business meeting during which plans were made for the annual "Pig Roast." This is an annual student-faculty dinner for the ceramic students, and always loads of fun.

S.B.A.C.S.

President—F. Hummel
Vice President—M. Combs
Secretary Treasurer—A. K. Porter

KERAMOS

President—N. Schoeppel
Vice President—W. M. Turner
Secretary-Treasurer—L. G. Ekholm
Herald—P. M. Wheeler

Mechanical Engineering

CONTINUING its policy of presenting short student talks, the student chapter of the American Society of Mechanical Engineers has held several meetings devoted entirely to such talks. These speakers are being rated by their fellow members in the audience on the manner of presentation and subject matter. The member with the highest rating will receive a biography of John Edson Sweet. One of the more recent talks by C. E. Tarpley, entitled, "A Determination of the Properties of Wood," has been entered in a contest sponsored by the parent society. At another meeting there were motion pictures showing the use of machinery in the construction of Grand Coulee dam. On March 11 Professor P. E. Mohn of the Mechanical Engineering department began a series of three illustrated lectures on grates and boilers.

A.S.M.E.

President—L. C. Danielson
Vice President—C. E. Beck
Secretary—P. D. Hess
Treasurer—J. H. Coulter
Publicity Manager—C. H. Dunn

PI TAU SIGMA

President—R. E. Donnelly
Vice President—W. W. Peters
Secretary—C. H. Dunn
Treasurer—M. E. Harvey

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Mining and Metallurgical Engineering

THE MINERAL Industries Society and the A.I.M.E. began this semester's program with an election of officers, February 19. Besides a few "experience meetings" at which students present talks on their experiences relevant to the fields of mining or metallurgy, the society featured talks by a number of distinguished men. A few of these were Mr. D. B. Reeder, metallurgist for the Electro Metallurgist Company, Mr. H. W. Zeiler, president of E. Leitz Company, and Mr. G. H. Liliequist, metallurgist for the American Steel Foundries. They expect to present Dr. M. A. Grossman, director of research for the Illinois Steel Corporation, in the near future.

MINERAL INDUSTRIES SOCIETY

President—A. G. Gossard
Vice President—H. E. Oehler
Secretary—I. W. Sherman
Treasurer—L. R. Kovac

•

Railway Club

AT THE meeting of the Railway Club, February 16, the officers for the second semester were elected. Besides planning for Open House, the club has been holding weekly meetings on Wednesday afternoons. These meetings, open to anyone interested in railroads, have been well attended.

RAILWAY CLUB

President—R. W. Tonning
Vice President—J. R. Wilmot
Secretary-Treasurer—M. J. Goers

Electrical Engineering

THE STUDENT branch of the American Institute of Electrical Engineers is sponsoring student talks. These talks or papers can be entered in an A.I.E.E. district contest. Recently H. A. Petersen discussed "Vibrations in Electrical Systems," and C. A. Vallette illustrated "Modern Sound Recording." At other meetings the chapter saw a sound motion picture by the Illinois Bell Telephone company, and heard talks by R. D. Hart of the meter department of the Central Illinois Light Company, and Mr. Smedley of the Super Power Company of Illinois.

A.I.E.E.

President—R. A. Kempf
Vice President—W. Johnson
Secretary—W. P. Hoban
Treasurer—E. Cwiklo
Publicity Manager—H. J. McSkimin

ETA KAPPA NU

President—R. L. Hull
Vice President—S. W. Ryden
Secretary—D. K. Chinlund
Treasurer—L. Bleuer

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Agricultural Engineering

ACCORDING to the latest reports, the student branch of the American Society of Agricultural Engineers is in the midst of one of its most active years. Besides making plans for the national meeting of the A.S.A.E. which is to be held here on the campus in June, the society has presented several interesting talks. During the Farm and Home Week they operated a lunch stand which netted a handsome profit of over $70. Some of their speakers have been Professor E. W. Lehmann, head of the Agricultural Engineering department, who spoke on "Rural Electrification," W. H. Bixby, who gave an interesting account of his summer's work conducting horse pulling contests, and R. F. Skelton reporting on his experiences in the operation of a cellulose digestor. Other recent talks included one by K. E. Fuller on, "Five Meter Radio," and one by Mr. Fletcher of the Caterpiller Tractor company.

A.S.A.E.

President—F. W. Andrew
Vice President—R. F. Skelton
Secretary-Treasurer—R. Boardman

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Tau Beta Pi

THE NATIONAL engineering honorary fraternity, Tau Beta Pi, has held several meetings this semester, at the first of which the officers were elected for the second semester. At another of their meetings Professor G. L. Clark of the Chemistry department presented his interesting talk on X-rays. The members of the fraternity have also been busy preparing for the new members that will join them in this coveted honor.

TAU BETA PI

President—R. C. Purl
Vice President—M. E. Harvey
Secretary—H. E. Skinner
Treasurer—E. W. Zelnick

Students and Faculty Bid Farewell

Professor Hardy Cross

Reputed Engineer and Admired Teacher

AT THE END of this semester the University of Illinois will lose a great man, one of the greatest and best-known of its engineering faculty, Professor Hardy Cross, one of the most widely recognized structural engineers in the United States today, will at that time bring to a close his service here to become head of the Department of Civil Engineering at Yale University.

Teaches Illini 16 Years

For 16 years Professor Cross has taught structural engineering here at the university, and during that time he has not only established himself in the minds of the students as a great teacher, but has also gained international recognition for his unique and simplified methods of applying structural analysis to design. The most widely known of his contributions is the theory of "moment distribution" which was first published in 1930, although Professor Cross had been developing it for many years previously.

The principle of this distribution of moments was an altogether new approach to the problem of analyzing complicated, statically indeterminate rigid or continuous frames, involving no more complicated mathematics than simple arithmetic. Conclusive proof of the brilliance of the man who originated the theory may be seen in the rapidity with which others, totally unfamiliar with its development, grasped the fundamental procedure so as to see its far-reaching utility.

Professor Cross, however, does not limit his thinking to structural steel design, and his latest published bulletin has to do with the analysis of flow in networks of conduits. This deals primarily with hydraulics and electrical analysis.

Analyzes Flow In Conduit Networks

As he states in his bulletin published by the Engineering Experiment station: They are, "methods of successive corrections. The convergence is apparently sufficiently rapid in all cases to make the methods useful in office practice." The story has gone about the campus to the effect that the development of this method of analysis, was an overnight solution to a problem with which engineers have been struggling for years. Professor Cross, however, modestly states that he had toyed with the problem for some time, not knowing how many people were interested in it, and it was after he talked to Professor Doland that the theory crystalized into a practical method.

Born In Virginia

Professor Cross was born in Nansemond county, Virginia, on February 10, 1885; 52 years ago. He attended Hampden Sydney College, and in 1902, as valedictorian of his class, received a degree of Bachelor of Arts. In 1903, at the age of 18, he received a Bachelor

HARDY CROSS

of Science degree from the same school. Later he attended the Massachusetts Institute of Technology, and in 1908 received a degree in civil engineering. Between 1902 and 1906, before attending M.I.T., Hardy Cross instructed in English at Hampden Sydney, and English and mathematics at Norfolk Academy. The reason for his decision to enter the engineering profession was exceedingly simple. None of his family had ever been engineers. Also, he could see little future in teaching liberal arts subjects in preparatory schools. Once in the engineering profession, he found that it intrigued him and he has made an enviable record.

Has Enviable Record

After leaving M.I.T. he entered engineering practice for a time, received a master's degree in civil engineering from Harvard in 1911, and later served for seven years as assistant professor of civil engineering at Brown university. It was in 1921 that he first came to Illinois.

In the years that Professor Cross has been here at this university, he has done much to establish it as the foremost structural engineering school in the nation. His very presence has attracted many structural engineering students, who believe that they may learn best from personal contacts with a recognized authority. As an extension course, to enable practicing engineers to learn of new methods of analysis, Professor Cross last year instituted an extracurricular class in rigid frame design, in Chicago.

Professor Cross has also written a number of bulletins and technical papers. Those published by our Engineering Experiment station are: Bul. 203, Dependability of the Theory of Concrete Arches (1930); Bul. 215, The Column Analogy (1930); and Bul. 286, Analysis of Flow in Networks of Conduits or Conductors (1936).

Member of Many Societies

Hardy Cross is a member of many engineering societies and fraternities. These include: American Society of Civil Engineers, American Railway Engineering Association, American Concrete Institute, Western Society of Engineers, Society for Promotion of Engineering Education, Kappa Alpha, Sigma Xi, Tau Beta Pi, Sigma Tau, Chi Epsilon, and Omicron Delta Kappa. In 1933 he received the Norman Medal from the A.S.C.E., in 1936 the Wason medal of the American Concrete Institute, and in 1934 an honorary degree of doctor of science from Hampden Sydney college.

Cross Defines Engineering

"Engineering," says Professor Cross, "is 'sticking power,' that is, more guts than brains." We shall give this back to him with the statement that he has plenty of both. The time draws near when we must say good-bye to this original, clear-thinking man who has shown us the way. Though we shall miss him here, we wish him good fortune in his new position at Yale.

—B.O.L.

St. Pat's Ball

IT IS THE purpose of this simple insertion to record definitely the astounding success of the annual St. Pat's Ball, sold out many days in advance of March 12. In spite of rather tough going, the Engineering Council gave St. Pat one of the most unusual birthday celebrations he has ever been accorded on the campus of the University of Illinois. The predominating theme was cabaret with a harmonic balancing of engineering style and enthusiasm. Not only was Brick Burns, C.E., crowned St. Pat, but, in addition, Professor John S. Crandell established a precedent by crowning Gail Boyer, Alpha Gamma Delta, Queen of the Ball. A very able floor show entertained. Dick Cisne played for dancers who jammed the floor at every opportunity, and the Technograph, presented as a unique program, enjoyed one of its widest campus circulations. The engineers gave this campus its first successful major cabaret, thus proving that South Campus is not the only place where one may enjoy a liberal education!

And NOW WHAT??

Unwanted Advice To Busy Readers

COMMENCEMENT will very soon be here again and another crop engineer graduates will be loosed to find jobs in business and professional fields that are in the midst of their respective recoveries from the effects of the recent depression. There was a time, long ago it seems, when college graduates were in great demand, and seniors expecting to graduate had at least four or five excellent positions from which to choose their work. But in the lean years the jobs were scarce and the choice, if any, was limited. Now, with business over the threshold of the long-expected prosperity, many firms are once more building up their engineering personnel. The senior may look forward beyond graduation with hope for a job.

Letters requesting men are again finding their way to the offices of the heads of the various departments, and recruiting committees for the large companies are making visits to the campus for the purpose of interviewing prospective graduates. Once more the "above the average students" are finding it necessary to choose between two or three positions and are finding it difficult. It is for these students especially that this article is intended, not as a complete treatise, but as a summary of the opinions of others about the university.

Graduate Study

First, let us consider the question: Shall I go on and take graduate work for two more years? Without question, there are certain positions in industry that are especially suited for men with advanced degrees, while for other work the extra courses are totally unnecessary. But it is not the future opportunity that is the determining factor, for one naturally desires the better job. More often the question is determined by: Am I financially able to attend school for two more years? Assuming that the first four years have not exhausted the pocket book, and it is possible to continue for the advanced study, let us look further.

The principle advantage held by the graduate student is that he has received certain technical training not received by others, and, consequently, he is better fitted for higher positions than the ordinary college man and may command a higher beginning salary. But, though he has the training, is he better fitted than another who has had two years of practical experience in actual field work?

A consensus of opinion is that one or two years of engineering experience—meeting people and problems as they actually occur—gives one a more mature outlook and later enables one, if he so chooses, to get the maximum amount of good from graduate research. The university will remain—return when you are truly ready.

For many years public service or governmental service was looked upon with contempt, but with the developments of the past few years, with the tremendous amount of governmental aid, that feeling has in part died away and engineers are less reluctant to accept positions with federal, state, or county agencies. With the return of expanding private enterprise, this tendency may not continue, but at present there are many young men who seriously consider entering public service.

On the whole, beginning salaries in public employment usually exceed those in private employment, but the disadvantage is that there is relatively little opportunity for advancement. In private industry the higher-ups are constantly on the watch for enterprising men who may be advanced. In public work one might hold the same position for 10 or more years, with but little increase in salary, fearful that if any signs of dissatisfaction is noticed another engineer will be appointed.

Gradually the field of public service is being made more attractive for professional men by far-thinking individuals who realize that there is a need for trained men in government. However, the ideal is still far off, and until conditions are bettered considerably, one should not stay in public service for more than a few years. The two years or more experience gained in federal or state work will frequently prove to be the stepping stone to better work, and the contacts made in public service may prove to be invaluable.

Large Companies

If you seek employment with some large company, speak to others about it and learn their opinions. Many large firms are excellent to work for while others have certain undesirable policies which make service for them unpleasant. In some large places conditions similar to those in political positions exist. If there are many thousands of men employed, the companies often consider it efficient to retain each man at the work in which he was trained, without promotion or hope for it. And again the relatives of certain officials will be promoted more rapidly than some more able employees with less influence. Private employment is not all good and the young man must be wary. As an example we may cite the railroads. Some are excellent, and employees are treated fairly and with consideration, while certain others are undesirable employers for engineers. One engineer recently listed only five Illinois railroads as ones for which he would like to work. One of the principle policies of the railroads that makes it difficult for newcomers is that of seniority, putting length of service before ability.

Small firms, though not usually the ones that pay the highest salaries, are often the best to work for. From the standpoint of experience, the work in a small company is probably varied and the experience obtained in the course of a few months is equivalent to that obtained in years with larger companies. Such experience is important! From the standpoint of opportunity and advancement, the small firm is again excellent, for in such a firm changes usually take place rapidly and opportunities for advancement always exist. Although the pay envelopes may be smaller at first, in time they increase; and in the expansion of a small company, such as one of consulting engineers, there is always room at the top.

—Courtesy Scientific American

Now, in summary, after we have skimmed through some of those general classes of occupations in which seniors expect to obtain work, it appears that the small enterprises are probably the best in which to seek employment. Yet, due to the comparatively high beginning salaries, some governmental departments would be excellent places to find work. Later, when the experience gained is sufficient, good jobs in private fields may be found; unless, however, the government job proves to be a good one, in which case it might be best to keep it.

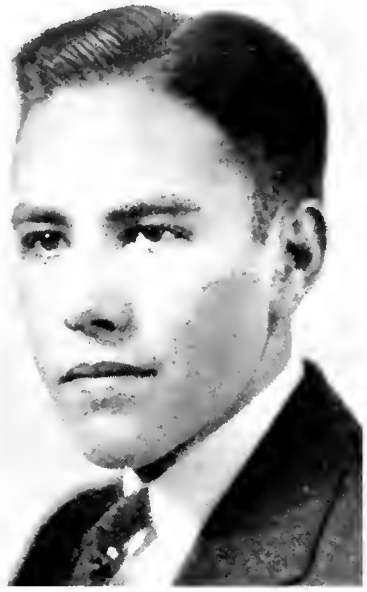
Opportunities Pregnant

Although recent strikes may delay certain developments, the various industries are making definite plans to employ large numbers of this year's graduates. In the steel industry alone, it is estimated that a thousand college men, from all of the colleges in the country, will be hired. Of these, 70 per cent will be engineers of every kind. Large companies, such as General Electric, maintaining research laboratories, plan to take on new research men from among the graduates.

But the greatest number of men, from any university, will probably get work through the recruiting committees or through recommendations, sent in reply to letters from the small employers. In addition to these, the faculty members know who to contact or where to seek, and they are always able to find work for the students where it is often least expected.

—H.W.A.

• WHO'S WHO IN ILL



• *Lloyd C. Danielson*

• *Edward C. Cwiklo*

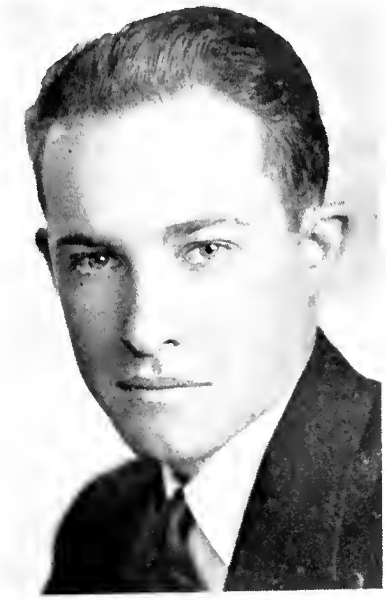
• *Raymond A. Kempf*

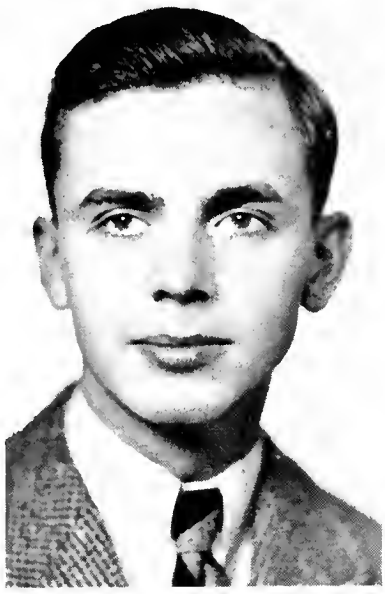
LLOYD C. DANIELSON has been a busy man since coming to the University in 1935 from Kansas State College. Not only has he joined Pi Tau Sigma, but he is now president of the Student Branch of the A. S. M. E. and chairman of the M. E. Department Committee for Open House. In addition he is a member of the American Society of Heating and Ventilating Engineers and the American Society of Railway Engineers. One would be inclined to think that the above mentioned activities would take up all of Lloyd's time. This is not true. He also has a part time job with Montgomery Ward and Company in Urbana. For three summers he has worked as a sales engineer with the Air-Conditioning Company of Russell, Kansas, his home town. Occasionally Lloyd likes to relax and take his mind off engineering. At such times one might find him pouring over his collection of old coins or engaging in a bit of amateur photography. But if he wants something more strenuous he gets out the tennis racquet, the swimming suit, or both.

EDWARD C. CWIKLO grew tired of Joliet, his home town, and came to the U. of I., adventurously moving into Newman Hall. But before taking this drastic step, he attended Joliet Township High School and Junior College, which, he claims, is one of the first junior colleges established in this country. Since coming here in 1935, Ed has tapped into many circuits. Last semester he was president of Eta Kappa Nu, and this semester he is treasurer of the Student Branch of the A. I. E. E. His scholastic work has also won him membership into Tau Beta Pi and Phi Kappa Phi, all-University honorary. Unlike most E. E.'s, Ed's main interest is not in radio. Instead, any spare time he finds, he spends in reading, writing, and automobiles. According to his neighbors in the Hall, his pet pastime is "shooting the bull," and many of Ed's tales are intimately connected with his long and interesting experience as grocery clerk.

RAYMOND A. KEMPF, a Peoria product, is one man who combines his profession and his hobby. When not assimilating the material thrown his way by the E. E. Department, he is busy operating an amateur radio station under the licensed call of W9DKF, a license he has held since 1930. Before coming to the University two years ago from Bradley Tech, in Peoria, he had contacted over 6,000 amateur radio stations all over the world. Using the knowledge gained from working two years with the Radio Manufacturing Engineers in Peoria, he built the 14 megacycle transmitter in the radio laboratory. Ray spends a good deal of his time operating it and the Synton transmitter in the Armory. During the two years he has been at Illinois, he has become chairman of the Student Branch of the A. I. E. E., member of the Engineering Council, member of Synton, professional radio fraterity, and Eta Kappa Nu. He was recently made a member of the Exhibit and Transportation committees of the 1937 Open House. When accused of making a hobby of attending burlesque shows, Ray emphatically denies it with the pretention that Electrical Engineers don't attend such things.

NGINEERING WORLD •





Ernest W. Zelnick •

Walter M. Turner •

William W. Peters •

WILLIAM WARNER PETERS is another of those men who can attend Bradley Polytechnic Institute in Peoria for two years and still come out on top in this College of Engineering. Prior to moving to Oak Park, Illinois, Will had lived in Peoria for 22 years. He got his early training in mechanical engineering by working in a machine shop every summer since his sophomore year in high school. After spending one year as a salesman, Will decided that engineering would be a better field of endeavor. After transferring to Illinois at the beginning of his junior year, he received the S. H. Ingberg Award of student membership in the American Society for Testing Materials. Only two of these awards are given to University of Illinois students each year. Last semester he was treasurer of the Student Branch of the A. S. M. E. This semester he is vice-president of Pi Tau Sigma. Will's pet hobby is photography, as one could easily guess by looking at the apparatus in his room, but he modestly admits that he also knows enough about tennis and canoeing to enjoy them both.

WALTER M. TURNER hoped to be a ceramist, so after graduating from Kewanee, Illinois, high school in 1933, he came to the U. of I. As a junior he was secretary-treasurer of the Student Branch of the American Ceramics Society. Now, as a senior, he is vice-president of Keramos, ceramic honorary society. He is also captain in the Engineer Corps of the R. O. T. C. In the forthcoming Open House, Walt is to be in charge of the pottery exhibits. When asked if he had any hobbies, Walt promptly named off the following list: Photography (how unusual), hiking, bicycling, dancing, music, and sleeping. Walt has definite ideas concerning dance orchestras: Guy Lombardo and Horace Heidt are tops; his opinion of such bands as Fats Waller and Cab Calloway would be censored, so I'll leave it out. Walt is somewhat of a humanitarian, too, having worked for the Henry County Relief Bureau as a social service worker.

ERNEST W. ZELNICK is a big man in the C. E. school; in fact he would be a big man in any school, six feet five and one-half inches making him decidedly ineligible for the midget class. After completing high school and two years of college, all at Morton Junior College of Cicero, Illinois, he definitely decided that engineering would make a better career than fishing. (Sometimes, I wonder.) So, packing up his bags, he came south. His activities on the North Campus started with membership in the Student Branch of the A. S. C. E. It wasn't long before he was initiated into both Chi Epsilon and Tau Beta Pi. He now pounds the gavel for Chi Ep in the capacity of president, while the Tau Bete's have placed their money bags in his hands. Last summer the lure of a job was strong enough to draw him back into Champaign-Urbana to take a position with the Illinois Water Service, a job which still occupies much of his spare time. Of his two hobbies, hunting and fishing has precedence over photography, and anyone searching for Ernest in the summer would probably have a merry chase over the states of Wisconsin, Minnesota, and Michigan.

THE RIGHT ANGLE . . .

A Toast to Spring

Once again the trees are busily preparing to shelter Engineering hall. The birds have long since announced their repertoire for the season. Dainty blossoms add zest for the occasion. Even the Boneyard is vainly striving to be the "sparkling brook" of the poet's verse. With nature using all her forces, it is obvious that the engineering students can not remain oblivious to this change. They can be seen staggering their way to or from M. T. L., forgotten slide-rules in their hands and a far away look in their eyes as they stare at the clouds.

It is strange that this phenomenon occurs year after year. Each time the reactions remain similar in spite of the changing circumstances. Let us slyly examine the thoughts of one of these men as he goes on his unsuspecting way.

"Boy, but it's great to be out! Another stuffy two-o'clock and I'll be finished. Golly, I guess the year is practically over. Courses were pretty interesting, but it was not always the instructor's fault. Funny what a difference a teacher's attitude has in putting over the material. Wonder why some of those birds don't realize that the students wouldn't sleep if they said something interesting, or at least tried to make it interesting. Most of them are swell, though. You gotta give them all credit for knowing their stuff. It certainly is a treat when the instructor is really taking an interest in his students. Let's see—I guess I have two men that truly rate. They are considerate, understanding, and darn human.

"Gee, it's a long time back to that All-Engineering Smoker. Guess I'll remember that for a long time. Plenty of excitement over that slide-rule raffle. No luck for me, ever. Societies seemed plenty active. Those Ceramists certainly went to town this year. Put over a good dance, and then a year-book. Wish our outfit had that ambition. Well, I suppose I was no better than the rest. Ready to criticize, and only work when prodded. Then, St. Pat's ball! Golly, we put something over on South Campus with our cabaret. Boy, that was a keen date. Pretty eyes—yep, I guess that's what put an end to my searching, and a break for me.

"Let's see, there's something else. Open House!! That's it! I'm glad I got in it this year. Learned a lot helping prepare those exhibits. Then, too, it's a lot of satisfaction knowing that you yourself had some little thing to do towards putting it over. And according to all indications, it is going to go over with a bang! Engineering Council—I guess that's the outfit responsible for a lot of the activity here this year. Swell fellows, every one of them, and a bunch of hardworking men. Bet if I were a little more ambitious I could have been elected president. Anyway, I managed to get a good job, and, well who can tell, maybe I'll be able to look at those pretty eyes across a breakfast table soon.

"What the deuce! Well, how did I ever wander over here on the South Campus. Guess I missed my two-o'clock. Well, what a coincidence—those eyes could belong to only one person . . ."

Your Life—An Activity

The engineering student no longer has that sublime privilege of minding his own business—others are assisting and many times taking the job entirely over. First a whisper, now rapidly gaining the amplitude of a severe thunder storm, the word *activities* has sounded over the head of every student. The ambitious heed it with a zealousness to get ahead. Others try to escape it with indifference or by burying their heads in a book (not necessarily a text). Whichever the situation, a reaction is evident.

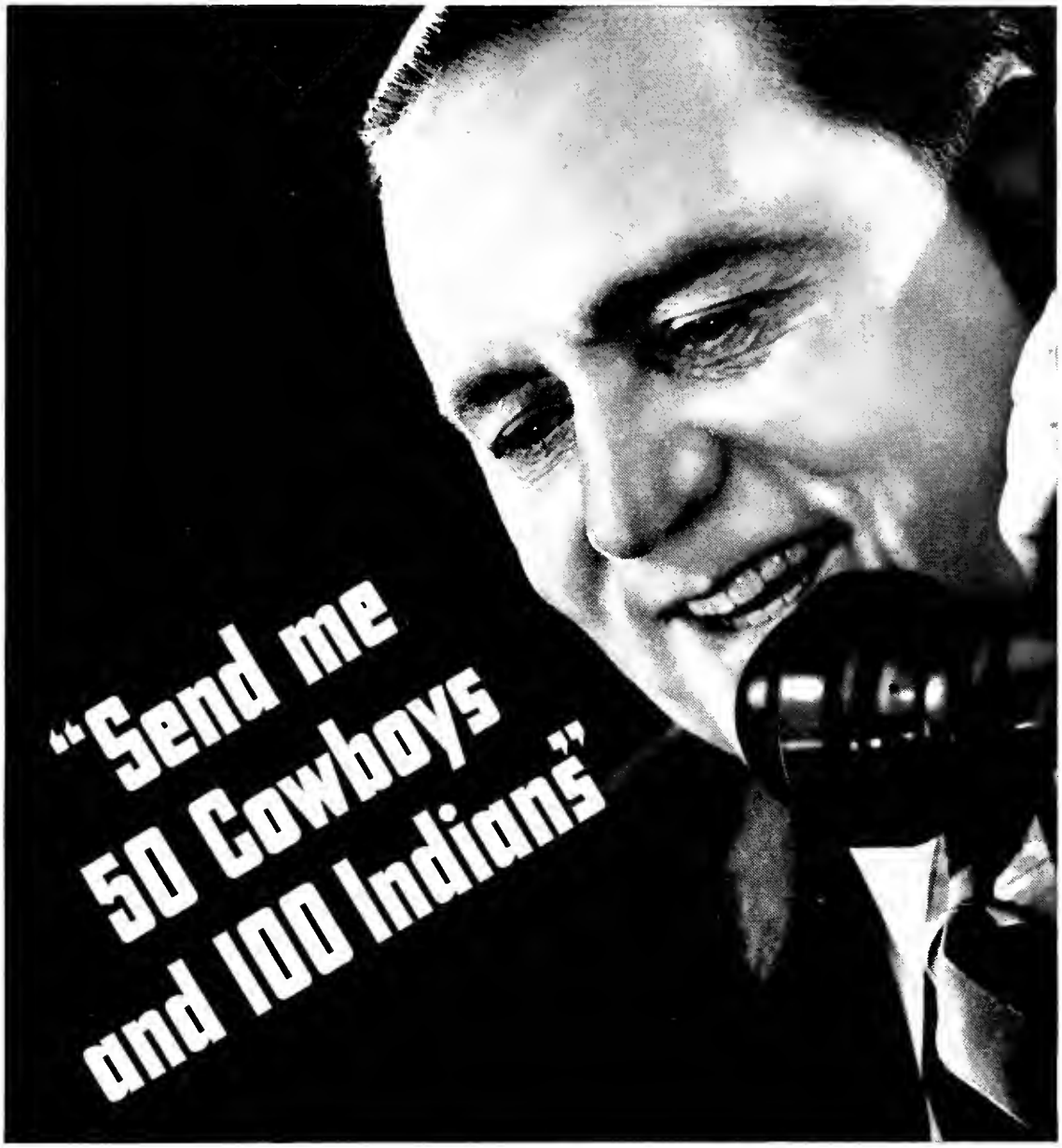
What does a superficial examination of the word indicate? From Webster we get ". . . liveliness in doing." From the advocates we receive a more subtle treatment. Although they grant that the engineering profession is difficult and satisfying, they argue that the word finds only an indirect application here. For a more intelligent appreciation they recommend, in addition to your school work, that you become a member of your departmental organization, exercise your prolific literary talents with the college publication, take an active part in a few entirely non-technical activities (Glee Club, Dramatic Club, etc.), have a job so that you more fully understand the meaning of independence, and, finally, study, because good grades make the honoraries, and honoraries too come under the general heading of *activities!*

With this as the typical student's conception of activities, it is not difficult to see his perplexity. Unfortunately too many become *active* without trying to scrape beneath the surface of this all too obvious pitfall. As a result neither he nor his organization benefit from the time devoted.

Each man has his individual philosophy. He looks for an expression of his ego. Engineering students have given shape to that urge with a very definite form. The rough mold is to be hewn during their four years at college. The more subtle and delicate task of finishing the job will go on and on to an unpredictable future. It is the rough shaping that interests the student. His tools are only as sharp as his wit. The development he looks for will come not from a book, but from his mind. It is at this point that activities have their rightful place. They must be applied cautiously but surely. Activities can provide a fine balance to a stunted diet. They must, however, be picked with judgment, well masticated, and then allowed to digest.

"Hard work is good for the soul." Hard work? Yes! But surely not foolish or useless work. Too many students are trying to do too much. Sacrificing one thing for the other, in an ever un-ending cycle, eventually leaves them tearing their hair. Then the other extreme looks askance with scornful eye, muttering, 'I told you so!" Life is too short to waste time doing either. I think we all have the best time when we work hard at something interesting. Choose those things to do that interest you, let them be your activities, and then do them well.

Activity is ". . . liveliness for doing . . .," and life is our only activity!



WHEN Hollywood wants to film a scene requiring hundreds of "extras," it makes a telephone call—and gets them. ¶ This is made possible by a central casting bureau, whose amazingly fast service is based on systematic use of the telephone. This organization has a telephone switchboard where as many as 30,000 calls a day are handled in bringing actors and producers together. ¶ Another example of the value of telephone service to business and social America. It is the constant aim of Bell System men and women to make it ever more useful—constantly better.

BELL TELEPHONE SYSTEM

Keep in closer touch with home—by telephone. Rates to most points are lowest after 7 P. M. and all day Sunday.

SCIENCE

SCIENCE has again thrust its cold, factual nose into into the colorful world of art in an attempt to inject practicability, economy, and versatility into the musician's instruments. Music, thus far practically untouched, has finally succumbed to the engineer, whose efforts tend generally to the production of synthetic sound. The difference in the viewpoint of the engineer and the musician accounts for the difference in opinion as to the success of the experimentation.

It must be borne in mind that there are two classes of instrument users: the professional musician, who knows his instrument from "A to Z" and demands the utmost in performance from it, for on it depends his livelihood; and the amateur who merely plays or listens to an instrument for his amusement, and who is more likely to be effected by the cost of the instrument than by its quality.

Thus it is natural that the engineer, being practically minded, should choose the field in which he can do the most good, even though the field belongs to the musicians.

The engineer has built a musical instrument and presented it to the world of music expecting to have an open-armed reception. But, as ever before, the musician finds it hard to assimilate a new instrument. The truth of the matter is that he does not want to accept it. The saxophone was outlawed for many years before the gate was eventually, although reluctantly, opened to it. Now, with the advent of the Electric Organ, a new storm of protest is arising, generating principally from the ranks of the older, classical musicians.

It appears that the manufacturers made a mistake when they named the instrument an "electric organ" even though they are attempting to attract a certain clientele. The opposition immediately compares it with the reed organ and, if the results obtained are not exactly the same, they condemn it whole-heartedly. The electric organ is an instrument apart, different from any other, and must, therefore, be judged, not by comparison, but by the ability of the instrument to provide its own brand of music.

Present indications show that in a short time the organ will be universally accepted, not as a substitute, but as an entirely new instrument; and not only because of the economy in cost and space occupied, but also because of its versatility. It can be made to reproduce the tones of a number of instruments, and it gives a variety of sound effects hitherto impossible without a great assemblage of attachments to any one instrument.

One of the most interesting controversies over the organ arises from the question as to how perfect a scale is reproduced. The manufacturers maintain that their scale is a perfectly equitempered one, while the opposition contends that it is impossible to obtain a perfect scale when using this method of tone generation. The tone is generated by means of the interruption of a magnetic field by a number of revolving disks whose peripherys are cut in the form of a sine curve. The note obtained is a pure sine wave vibration and contains no harmonics. The frequency of the note is determined by the number of ridges on the wheel. This equitempered scale makes it practically impossible to generate half-notes with the disks because of complications arising from the fact that the half-notes do not have a rational number of vibrations per second. One can readily see that with the

IN MUSIC

number of teeth on the disk necessarily a whole number, it would be extremely difficult to reproduce half-notes accurately.

To find the reason for the versatility of the electric organ, we must refer to a fundamental principle of music. If two different instruments are producing notes at the same frequency, we are aware of a difference in the tone of the two notes. This difference is known as tonal quality or timbre. Actually the only difference between the two notes is the number and intensity of the harmonics the instruments are generating. Thus, the organ has, incorporated in it, a device for controlling the number and intensity of the harmonics so that the tone produced may be made to simulate practically any kind of instrument from the chimes of Big Ben to the French Horn.

An outstanding feature, immediately noticeable to the organist who has played reed organs, is the instantaneous action and light pressure touch. The keys are merely used for closing an electrical circuit which, of course, requires very little pressure or play in the keys. Because tone generation is electrically controlled, the action is remarkably instantaneous.

Science is proving again that it has a certain degree of aesthetic sense by entering the domain of the musician and creating for him, even against his will, more economical and practical instruments which are capable of producing music quite as beautiful as any from the time-tested instruments that are being used today.—R. S. B.

COMMON SENSE

THIS MORNING when I picked up my *Illini*, the first word that met my eye was *war*. As I glanced over the front page, I saw that there is a war in Spain, that the government is waging a war on criminals, that society is carrying on a war with reckless drivers, that Lewis' Committee for Industrial Organization is at war with the American Federation of Labor. However, I did not see a word about a war that started long before Herodotus began to write his *Historia* and will continue the world over long after our day. This war is being fought between mankind and fire, one of man's most useful but most treacherous friends.

One hundred twenty million Americans pay nearly half a billion dollars a year to fire. Ten thousand Americans give their lives. If the Huff Gymnasium had been destroyed during one of the basketball games last winter, the mass of humanity that would have been killed would not have equalled this number. Oftener than once every minute of the day and night, fire breaks out of bounds in this country and begins the destruction of homes, stores, factories, schools, and lives.

I consider myself lucky because my home has never burned. Yes, I pay. My home is insured. Fire insurance is nothing more than the apportionment of fire loss among all property owners. It has made money for very few people. The insurance underwriters' loss from the San Francisco conflagration of 1906 was enough to wipe out all the business profits from 1860 to that year.

The half billion dollar annual loss mentioned above, however, represents less than half the total property loss. The loss of records, orders, time, business, and many other intangible assets of a business or of a home causes much greater loss than the destruction of the insurable, replaceable property. For instance, the Department of Commerce has placed the following estimated value on its property:

Buildings	$ 25,387,000
Inventory, value of contents	10,875,000
Records and other uninventoried values	189,948,000
Total	$226,210,000

Records constitute more than 80 per cent of the property value of the department. Out of every hundred insured businesses that burn, 43 never reopen. A shoe manufacturer, the proud owner of a new, fully insured, fireproof building, saw the interior gutted by flames and his plant closed for nearly six months at a loss of nearly $40,000 greater than the amount of his insurance. In the West, a blaze which cost $1,100 destroyed records valued at a quarter of a million dollars.

All this is a terrible toll to pay for carelessness. Although the United States does pay it every year, I do little more about it than pay my insurance and hope that my home or business will not burn. However, mankind has offered organized resistance in this war for nearly 80 years. In 1860, the fire insurance companies of this country organized the National Board of Fire Underwriters. The purpose of this organization has always been to increase the profits of the insurance companies. At first the only work of the board was to standardize fire insurance rates. In the nineties, however, they decided that a good way to increase their profits was to decrease fire loss. In 1896, they founded the National Fire Prevention Association which has been

versus FIRE

functioning very efficiently ever since. Fire Prevention Week and Clean-Up Week are both sponsored by this organization. It has set up various fire preventative standards, such as building codes and fire department standards. Three years later, in 1899, the National Board of Fire Underwriters established the Board of Consulting Engineers and followed this up in 1901 by the greatest step in this whole mobilization of man's resources, the establishment of Underwriters' Laboratories in Chicago.

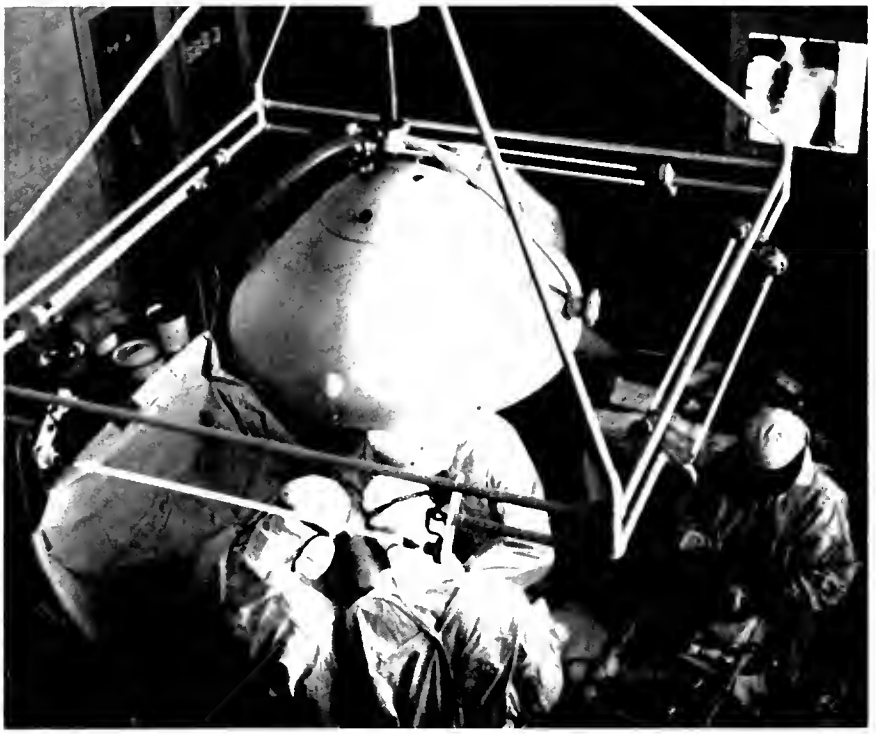
Last fall you probably bought an extension cord for your study lamp. Do you remember that little yellow band on the cord? On it were printed the words, "Underwriters' Laboratories Inspected." Even if you do remember, your probably never stopped to think what it meant or why it was there. Yet that little label carries a world of meaning. It means that cords just like yours have been subjected to hours of tests by experts. It means that the materials used in your cord had to meet certain standards for composition and strength. It means that your cord was inspected as made up, by an expert inspector. Why all this bother over a ten-foot cord? It means that the engineers of Underwriters' Laboratories have decided that your light cord will not be a fire hazard.

It has been stated, "This land of ours, in spite of the complexities of the things we possess and of the natural forces we use, is far safer to live in than it would be without the unheralded work of Underwriters' Laboratories." To walk by the unimposing, three-story, brick building at 207 East Ohio Street in Chicago, it is hard to imagine that inside, "Science is waging the war of Civilization with Fire." But here, in perhaps the most fireproof building in the world, works a force of about 200 experts and specialists who do nothing but test nearly everything that might cause or spread a fire. In one part of the building roofing materials are being tested by radiation tests and by exposure to actual flames blown by a wind machine that will furnish a gale of any desired velocity. No type of roofing gets the Laboratories' seal of approval unless it is really fireproof. In another building safe and vault testing is being carried on. Electrical devices of every description are tested in another room. Fire doors, shutters, windows, wallboards and many other building materials receive exhaustive study. Chemicals, gases, oils, and devices for handling these are tested. Fire alarms, sprinkler systems, signals, extinguishers and pumps are all tested. Many safety devices in other fields also receive the engineers' attention.

An Englishman once was given a list of points of interest in Chicago. When he left the city, he told his friends that his visits to Underwriters' Laboratories had been the most interesting to him.

The engineer will continue to be outstanding among the soldiers in this war against fire. However, the engineer who makes fire prevention his work is not the only one who contributes. The civil engineer, by designing his buildings to be fireproof; the mechanical engineer, by eliminating the fire hazards in gasoline engines, refrigerators and other machinery; the electrical engineer, by making all appliances safe; the ceramic engineer, by making fireproof building materials better and cheaper; all help to make our lives and property safer against destruction by fire. —M. K. C.

FOLLOWING THE PROFESSION



—Courtesy Electric Journal

Unseen Death-Ray to Bring About Lower Death Rate

Death Ray

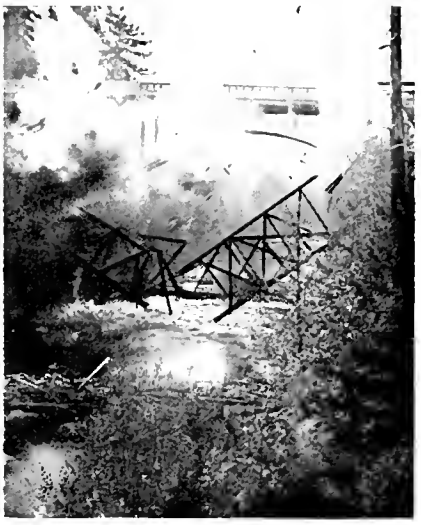
Not since the epochal work of Dr. Pasteur has there been a development in the field of bacteriology of more far-reaching importance than the introduction last year of a lamp by which the air in any particular space can be maintained sterile. This new type lamp produces a quality of radiation deadly to bacteria and spores. The lamp is a long, slender tube giving off a small quantity of greenish-blue light. The efficiency is remarkable, only a small amount of energy being lost as heat; a pair of these lamps with necessary transformers, consume less than 25 watts.

Already the device has been adapted for several widely different uses. Medical men, forever battling the causes of infection, are experimenting with these lamps for use in operating rooms. Cakes (for instance) are being subjected to a few seconds exposure to the germicidal rays of the lamp before being wrapped; thus the formation of mold is delayed by two days.

Experiments indicate that the new type lamp may have considerable application in the tenderizing of meat and for the preservation of meat in storage chambers.

Dynamiting Old Timber Trusses Adjacent to New Concrete

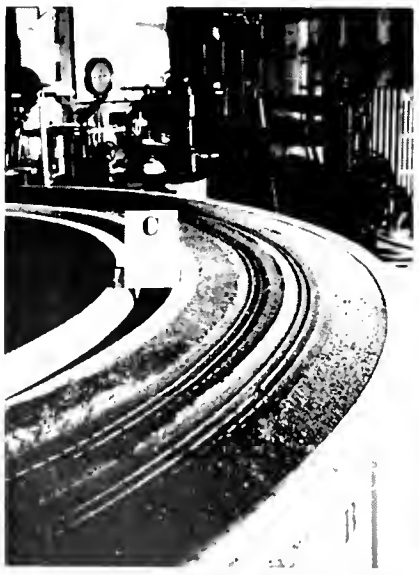
In order to remove a 140-foot span timber truss bridge cheaply and quickly, and without damage to a new concrete span immediately upstream, engineers at Estacada, Ore., used 30



Courtesy Engineering News-Record

Clearing the Way

charges of 60 per cent dynamite. After first removing the decking, the roof, and the stringers, the charges were placed at key points in the frame work of the bridge. For maximum efficiency, 38 charges should have been used, but the battery available had a capacity of only 30 fuses, so the outside timbers of the members were cut through at seven points. At the eighth point, the proximity of a high tension line prevented weakening of the timber. When the charge was set off, the structure did not fall exactly as planned, but instead, the upstream truss broke at about midstream because of a lag in the fall caused by the slow breaking of the member not severed.

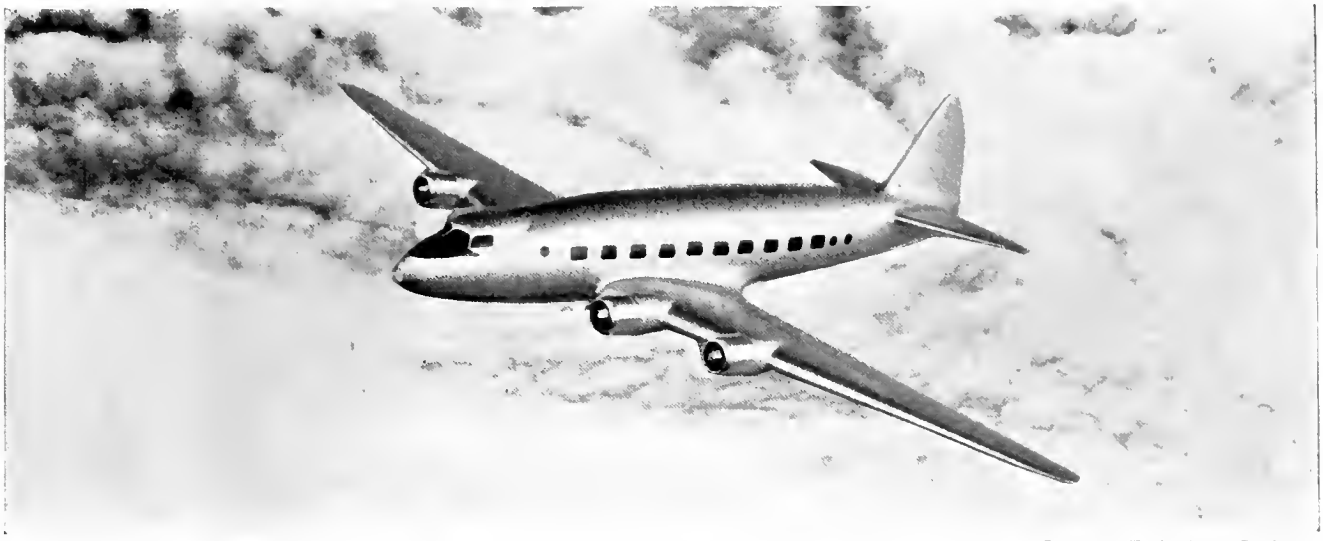


Courtesy Scientific American

Worn Surface of Road Testing Track

—Courtesy Public Safety

Making the World's Largest Bridge the World's Safest Bridge



—*Courtesy Technology Review*

Beauty, Comfort, and Safety In the Skyway

Tomorrow We Fly

Tomorrow's airplane calls for larger pay loads, greater cruising speeds, and more passenger comforts, together with lower operating costs. The airplane of tomorrow will be a low-wing monoplane designed to carry a pay load of 20 passengers and a half ton of mail from coast to coast overnight with only two intermediate stops, and using not more than 60 per cent of the rated power of the engines. Day and night passenger accommodations are required to be at least equal to that of a Pullman car, consisting of toilets, dressing rooms, a complete galley, and the latest radio and navigation equipment.

The all-metal, double-chambered wings will be reduced in area, but capable of supporting 24 pounds per square foot. The most desirable fuselage shape is the fish-shape form used by the Zeppelins. In cross section the fuselage is nearly circular and externally smooth without projecting door handles or rivets. Four engines were found to be most desirable for passenger service. This number was chosen because, if one engine were to break down, there would be 75 per cent of the power left and this would maintain the plane at specified rated power of 60 per cent. The fuel system is simple, consisting of a fuel tank for each pair of engines, integral with the wing in the box spar, giving a total capacity of 1,000 gallons. Each engine would have its own oil supply.

• TECKNOKRAKS •

A big buck Indian had just ordered a ham sandwich at a drug store lunch counter and was peering between the slices of bread when he turned and said to the waiter, "Ugh, you slice 'em ham?"

The waiter replied, "Yes, I sliced the ham."

"Ugh," grunted the Indian, "you damn near miss him."

Customer—"Are those eggs strictly fresh?"

Grocer (to his clerk) — "Pete, feel those eggs and see if they are cool enough to sell."

* * *

"Don't talk to me about lawyers, my dear. I've had so much trouble over the property that I sometimes wish that my husband hadn't died!"

* * *

"My good man, does this dog possess a family tree?"

"Oh, no madam—he has no particular tree."

* * *

Goodman—"Resist the temptation."

Weakley—" Would, but it may never come again."

* * *

The young lady walked boldly up to a woman whom she took to be the matron of the hospital.

"May I see Lt. Barker, please?" she asked.

"May I ask who you are?"

"Certainly, I am his sister."

"Well, well. I'm glad to meet you. I'm his mother."

* * *

Mrs. Harry Atkinson—"Harry, you carry the baby and let me have the eggs. You might drop them."

Adams—"Do you believe that kissing is unhealthy?"

Kay—"I couldn't say—I've never—."

Adams—"You've never been kissed?"

Kay—"I've never been sick!"

* * *

Girls when they went out to swim
Once dressed like Mother Hubbard:
Now they have a holder whim,
They dress more like her cupboard.

* * *

Sophisticated Coed—"My father is the best pistol shot in this country."

He—"What does that make me?"

S. C.—"My husband—to be."

* * *

Shakespeare said, "Love is a ticklish sensation around the heart that you can't scratch."

Ex-President Hoover says, "Love is something a girl plays with when she gets too big for dolls."

* * *

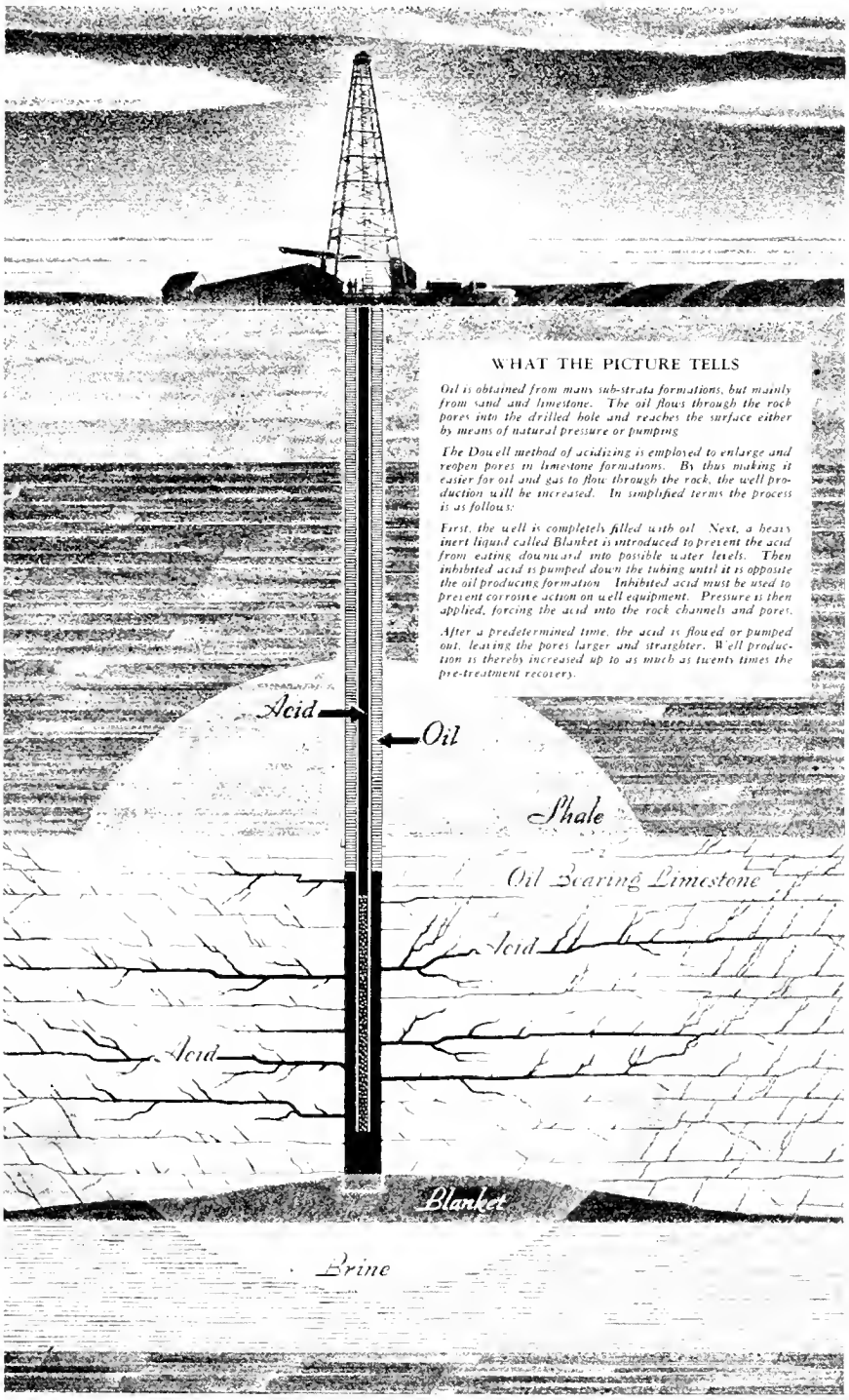
Jingle—"First it was love. He fascinated me—and I kissed him."

Bells—"Yeah, I know, and then he began to unfascinate you and you slapped him."

* * *

Definition: Research — a blind man in a dark room, hunting for a black cat that isn't there.

VITALIZING OIL WELLS VIA *Chemistry*



WHAT THE PICTURE TELLS

Oil is obtained from many sub-strata formations, but mainly from sand and limestone. The oil flows through the rock pores into the drilled hole and reaches the surface either by means of natural pressure or pumping.

The Dowell method of acidizing is employed to enlarge and reopen pores in limestone formations. By thus making it easier for oil and gas to flow through the rock, the well production will be increased. In simplified terms the process is as follows:

First, the well is completely filled with oil. Next, a heavy inert liquid called Blanket is introduced to prevent the acid from eating downward into possible water levels. Then inhibited acid is pumped down the tubing until it is opposite the oil producing formation. Inhibited acid must be used to prevent corrosive action on well equipment. Pressure is then applied, forcing the acid into the rock channels and pores.

After a predetermined time, the acid is flowed or pumped out, leaving the pores larger and straighter. Well production is thereby increased up to as much as twenty times the pre-treatment recovery.

SO VITAL is petroleum in our highly mechanistic age, that it might be said a nation's sword of Damocles is no longer suspended by a thread but by a drop of oil.

Since the days of Colonel Drake who gave America its first commercial oil well in 1859, the discovery and production of petroleum has constituted one of the most vivid chapters in our national development.

Billions of barrels have flowed from the earth's depths in close to one-half of our states—and there is little question that this abundant resource has literally oiled the wheels of American progress.

But, despite our apparently bountiful supply, both known and yet to be discovered, the need for more efficient and conservative production of petroleum has been long regarded as essential.

A sizable stride in this direction was taken when, five years ago, Dow brought to the oil-producing industry through its subsidiary, Dowell Incorporated, a specialized chemical service for oil wells.

Whereas formerly, through natural and mechanical means, oil producers extracted approximately twenty per cent of the potential petroleum accumulation, by putting chemistry to work they stepped recovery up to double, and even triple this amount.

Stripped of technicalities, Dowell undertakes through special acids and chemicals to overcome natural barriers to greater oil production in areas where oil is produced from limestone or dolomitic formations. To render this service, Dowell maintains headquarters at Tulsa, Oklahoma, and a complete field organization located in the principal oil fields.

To date it has treated over 9,000 wells, resulting in approximately $50,000,000 gain to the oil industry. In servicing these wells, Dowell trucks and cars have traveled 4,500,000 miles and its treating engineers have handled over 15,000,000 gallons of special acid.

Thus, Dow research and chemical application reaches out into another channel of usefulness—promoting and developing the value of a great national resource.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

Branch Sales Offices: 30 Rockefeller Plaza, New York City
Second & Madison Sts., St. Louis • 135 S. LaSalle, Chicago

DOW

CHEMICALS INDISPENSABLE TO INDUSTRY

G-E *Campus News*

IN EVANSVILLE

Into the flood zone several General Electric engineers—among them Henry Duval of Washington University, Eugene Darlington of Oregon State, and Harold Towlson of Clarkson Tech—took two radio-equipped police cars and played an important part in the relief activities along the Ohio Valley. The equipment included a two-way ultra-short-wave police radio set in each car, a 50-watt headquarters transmitter, and a 150-meter transmitter having its own gas-engine-driven electric generator—in reserve in case of power failure.

One of the engineers reported, "We arrived in Evansville and erected our antenna on the 75-foot tower of a bank building. We were on the air continually, rendering service to the flooded area."

In a further effort to aid flood victims, General Electric sent extra men to the G-E Service Shops in the affected area to speed repair work.

IT'S "NEW AMERICAN"

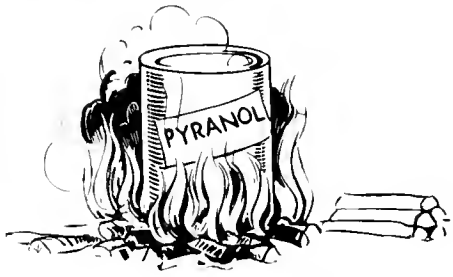
Conceived by General Electric, the "New American" home promises to influence profoundly the trend in American building. The program is sponsored in co-operation with all those professionally interested in building new and better homes.

The modern kitchen is one of the results of this work. It has been changed from just a room where a variety of tasks must be performed to a scientifically planned workshop. It is equipped with electric appliances which do the drudgery of kitchen work silently and easily. The electric range, refrigerator, dishwasher, Disposall unit, and modern lighting are but examples of the improvements which have been made in the home workshop.

The radial wiring system used in the "New American" home was designed for safety and convenience. Plenty of outlets for lights and for appliances are the outstanding features of this system.

The home is thoroughly air conditioned. Conditioned air is not only more comfortable but also more healthful, and the G-E air-conditioning units have been designed to promote such conditions.

With the elimination of wasted space, steps, and time throughout the entire dwelling—with the maximum in health, comfort, and economy—the "New American" home is building a brighter future for the cottage and the mansion.



IT WON'T BURN

Noninflammable and nonexplosive, this new cooling and insulating liquid, Pyranol, was developed by General Electric for use in transformers, capacitors, and cable. Its unusual characteristics have been recognized by the National Electrical Code, making it possible to install transformers indoors and at the load centers, without fireproof vaults. This results in savings in secondary copper and installation costs.

Pyranol is chemically stable and does not sludge, a feature which minimizes maintenance. Experience to date has showed that the materials used in Pyranol transformers have a longer life than under oil. The result—longer transformer life.

Pyranol transformers were first used in 1932, and now more than 700 units, totaling more than 200,000 kva of transformer capacity, have been installed, all giving excellent service.

96-375DH

GENERAL ELECTRIC