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The Wisconsin Engineer

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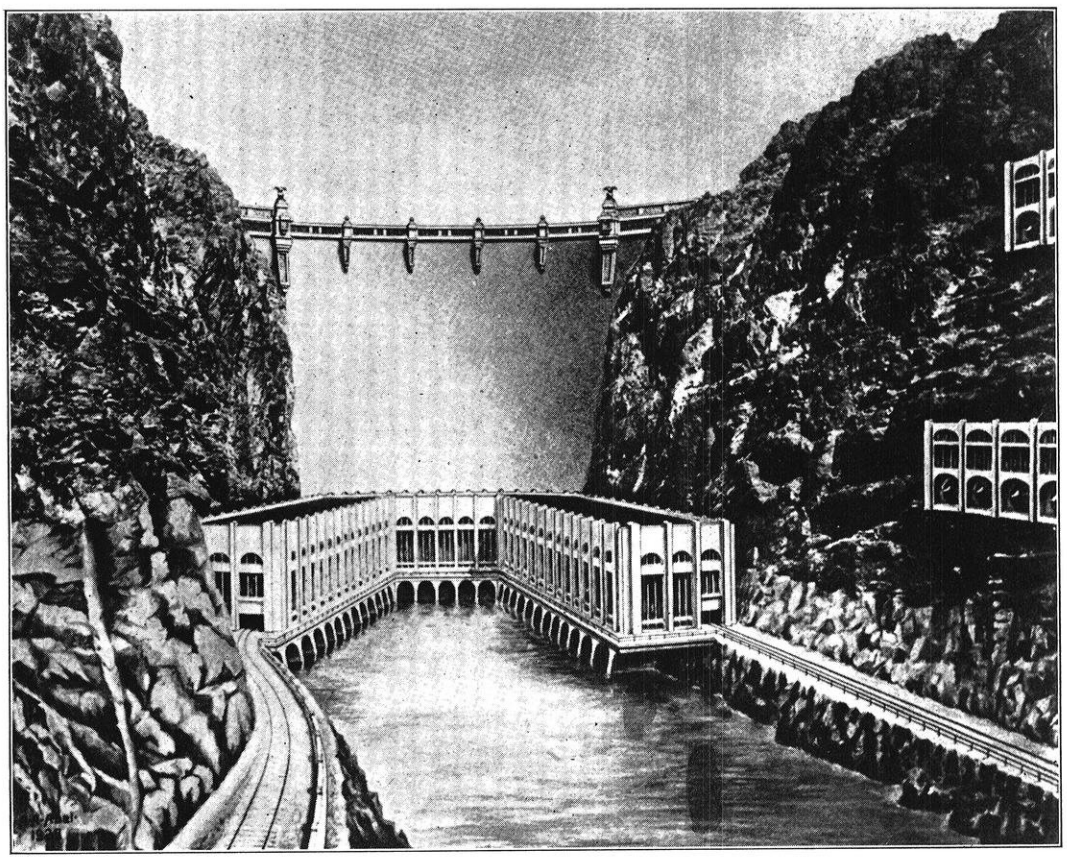

PROPOSED DAM AND POWER HOUSE IN BOULDER CANYON

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The Wisconsin Engineer

VOLUME 34, NO. 1 OCTOBER, 1929

The Colorado River, the Imperial Valley, and the Boulder Canyon Project

By Daniel W. Mead

In the extreme southeastern portion of California lies a remarkable valley. Thirty years ago it was uninhabited by man and was one of the most arid desert wastes in the world. Today, through the development of irrigation, much of the land has been reclaimed and its almost 5000 farms support a population of about 60,000 people, and produce fruits and farm products amounting to many millions of dollars per annum. The land developed as the Imperial Irrigation District lies entirely below sea level and this, with much adjoining land, was thousands of years ago a part of the Gulf of California. (Fig. 1).

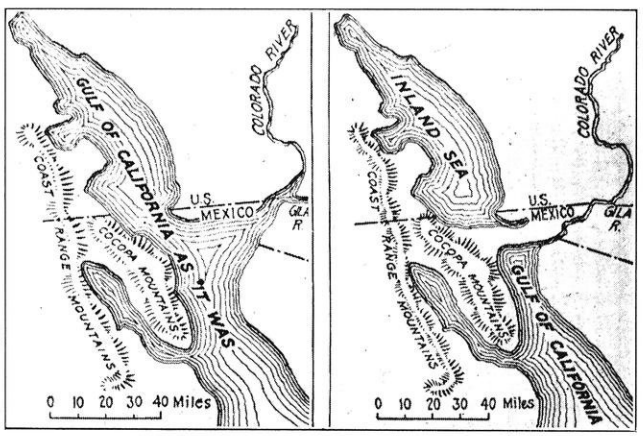


FIG. 1: Prehistoric delta conditions. Original conditions and a later stage, as sketched by J. H. Gordon, U. S. Weather Bureau, Yuma.

The Colorado and Gila Rivers, which in those days flowed into a bay on the eastern side of the old gulf, brought annually millions of cubic yards of sand and silt from the mountains which were deposited in the bay and gulf. The delta of these rivers gradually extended until the northern part of the area was finally cut off from the gulf and became an inland sea into which the rivers flowed and from which the waters overflowed to the Gulf of California. Finally the river channel sought the eastern border of the delta and flowed for many centuries directly into the gulf, while the inland sea, abandoned by the river, was gradually depleted by evaporation and became the desert of the "Salton Sink", practically without water except in spring time when the melting snows of the adjacent mountains drained into the sink but rapidly vanished each year with the advent of the intense heat of summer. (Fig. 2). Thus the desert lay unproductive for many centuries until the growth of population and the demand for farms to supply the needs of the country created conditions which made its development by irrigation financially feasible.

The building of a canal to conduct water from a point on the Colorado River 100 feet or more above sea level to the Imperial Valley at and below the level of the gulf, was not a difficult matter. The control of the canal so as to secure the amount of water needed for irrigation and water supply, and yet limit the flow so that the floods of the river would not follow the canal and drown out the lands of the valley, was apparently more serious and difficult than was originally recognized.

Early in the development (1904) when the work was well under way and considerable land was already under irrigation from the canal first constructed, the silt in the river water so filled the main canal as to create a dearth of water for irrigation, and in attempting to remedy this defect, ill advised construction was carried out which resulted in the floods of the river gaining such control that the river turned through the canal into the valley and flowed there for more than a year.

Millions of dollars were spent in efforts to close the inlet and turn the Colorado back into its former channel. This was finally accomplished by the Southern Pacific Railway Company which had large interests in the district. This work, together with the building of levees and their

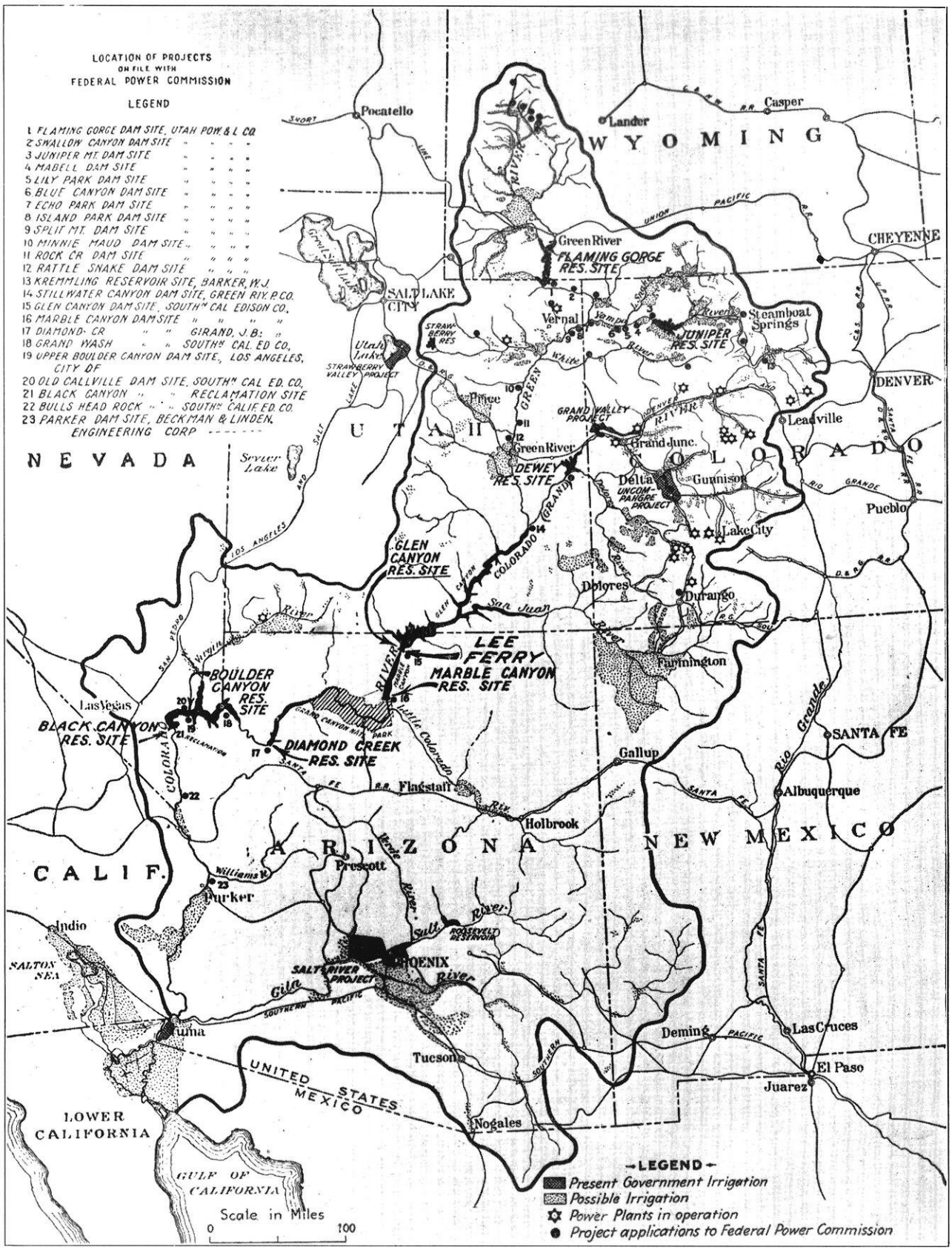


FIG. 3: Map of the Colorado River basin indicating power and irrigation possibilities. The shaded areas indicate an estimate of ultimate irrigation probabilities about one-third of which are now developed. Power sites for which applications are on file with the Federal Power Commission are shown by numbered circles, and stars denote location of existing powers.

(From Engineering News-Record, Jan. 8, 1925.)

protection for the Imperial district, the lands on the Mexican delta, and the Yuma Reclamation District, has involved expenditures amounting to over $10,000,000 since 1905.

The rapid raising of the delta lands by the annual deposit of the river silt involves a constant danger of the flooding of these districts and the constant expenditure for the maintenance of levees and for the removal of silt from canals so great as to prove a serious handicap to all the irrigated lands of the lower Colorado valley.

These problems of the lower Colorado seem to be the original incentive that gave rise to the Boulder Canyon Project.

The Colorado River (Fig 3) is one of the great rivers of the United States. Its drainage area includes parts of seven states, and embraces about 244,000 square miles, most of which is arid or semi-arid land. The rainfall on this area averages about ten inches per year, while the streamflow is less than fifteen percent of this amount. The precipitation on the mountains of Colorado, Wyoming, and Utah is comparatively heavy while much of the country, especially in the southern part of the basin, has an annual rainfall of less than 5 inches. The Reclamation Bureau has estimated the area, flow, etc.,

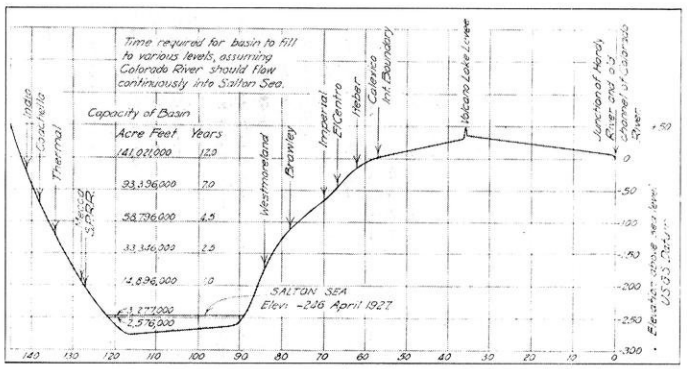


FIG. 2: North and south profile of Coachella Valley, Salton Sea, Imperial Valley, and Colorado River Delta.

TABLE I

APPROXIMATE DRAINAGE AREA AND AVERAGE ANNUAL DISCHARGE OF PRINCIPAL TRIBUTARIES OF THE COLORADO RIVER

Tributary	Discharge 1000 Acre Feet	Percent Total Discharge	Drainage Area 1000 Sq. Miles	Percent Total Area	Annual Discharge Acre Ft. Per Sq. Mile	Silt 1000 Ac. Ft. per Annum
Upper Colorado (Grand)	6940	40	26	10	267	20
Green	5510	32	44	18	125	30
San Juan	2700	14	26	10	105	29
Gila	1070	6	57	23	19	15
Other Tributaries	1560	8	91	39	16	19
TOTAL	17780	100	244	100	73	113

of the tributaries of the Colorado River as shown on Table I. From this table it is seen that about 90% of the total flow of the river comes from the upper basin above Lee's Ferry.

It is estimated that in the upper basin about 1,700,000 acres of land are irrigated at the present time. (See Table II). This irrigation takes place from April to September, inclusive, and takes from the tributaries of the river during three months about 3,150,000 acre feet, about 600,000 acre feet of which is believed to return to the tributaries below the various irrigation districts as seepage, leaving a net or consumptive depletion of about 2,550,000 acre feet or 1.5 acre feet per acre of irrigated land. In the lower basin, including Mexico, there is approximately 600,000 acres of land under irrigation requiring about 3,000,000 acre feet of water per annum. Here on account of the warm climate some water is used each month in the year, reaching a maximum from May to September inclusive and a minimum during December, January and February.

The stream flow of the Colorado River is subject to great variations. When the snow begins to melt in the mountains of the upper basin, a flood begins in the stream normally early in April. This usually reaches its maximum in June, and gradually subsides until the middle or latter part of August. For the remainder of the year the ordinary flow is comparatively low. In the lower valley, especially below the Laguna Dam, the normal flow of the Colorado as above described is modified by sudden floods from the lower tributaries, which may occur any month of the fall, winter or spring.

During the flood period there is ample water to supply all the demands of irrigation now developed but in the fall months, during years of exceptionally low flow, there has occurred a scarcity of water which was so serious in 1924, when it reached a minimum at the Imperial Valley intake of 1200 second feet, and a loss was occasioned by the consequent destruction of crops, estimated to exceed five million dollars.

The rights to the use of water in most of the arid or semi-arid states of the west are based on the common law of appropriation instead of on riparian rights, common to all of the states east of the Missouri River. The scarcity of water in these states has made it essential to permit the

TABLE II

PAST AND POSSIBLE FUTURE IRRIGATION IN THE COLORADO RIVER VALLEY

	Area Irrigated 1920	Possible Future Addition	TOTAL
Upper Basin	1,526,000	2,547,000	4,073,000
Lower Basin			
Above Laguna Dam	3,000	266,000	305,000
Below Laguna Dam			
Yuma Project	54,000	76,000	130,000
Imperial Valley	415,000	100,000	515,000
Imperial Extension		270,000	270,000
Mexico			
From Imperial Canal	190,000	65,000	255,000
Other Lands Available		545,000	545,000
Total in Lower Basin (Except Gila)	698,000	1,322,000	2,020,000
Gila Valley	430,000	400,000	830,000
TOTAL IN ENTIRE VALLEY	2,654,000	4,269,000	6,923,000

(Continued on page 34)

What the Class of '29 is Doing

TO the class of 1929, a toast. It is with pleasure that *The Wisconsin Engineer* wishes success to men of the College of Engineering who have begun their work-a-day careers since June 1929. Hoping that the material printed below may keep the class in contact with each other, *The Engineer* publishes the Alumni department where graduates may contribute news of themselves and their fellow classmates. In these pages, with your co-operation, we will continue that man to man interchange of knowledge of the world in which we live and what the men whom we remember are doing in that world.

By R. S. PLOTZ

CIVILS

Baillies, Duncan, has been employed as a draftsman for the Tallassee Power Company at Bryson City, North Carolina. His mailing address is in care of the above company at Bryson City.

Behm, Wilfred W., is back at the University as assistant instructor in Highway Engineering and City Planning. He is living at 118 West Johnson street, Madison, Wisconsin.

Burmeister, Wesley J., is now resident engineer with division number 1 of the Wisconsin Highway Commission located at Madison, Wisconsin. Mr. Burmeister is living at Middleton, Wisconsin.

Cullinane, John E., last year's St. Pat, has entered the contracting firm of John R. Cullinane and Son. John is at the present time in charge of the laying of a sewer to the new Tuberculosis Sanitarium on Highway 113. His residence address is 618 West Dayton street, Madison, Wis.

Fleischer, Julius M., has associated with Ray Seely, an engineer of Hammond, Indiana. At present Fleischer is working on sanitary investigations. His residence address is 33 Elizabeth street, Hammond, Indiana.

Miller, Harold F., has been employed as an inspector with the United States Government War Department. At present though, "Hal" is running a level on the Manistee river survey. Mail addressed to 120 Malvern Place, Milwaukee, Wisconsin, will reach Miller.

Greiling, Robert F., has been assisting in Inspection and Fabrication of bridges in Detroit under the guidance of the Wayne Board of Bridge Commission. His mailing address is 1601 Clark avenue, Detroit, Michigan.

Hahn, Harold S., has been working in the material testing laboratory for the city of Milwaukee. He receives mail at 428 Greenwich avenue, Milwaukee, Wisconsin.

Hersh, Marvin, former editor of the Wisconsin Engineer is working in the Materials Testing Laboratory of the city of Milwaukee. He is living at home at 1034 Grant Boulevard, Milwaukee, Wisconsin.

Hillis, Leonard F., has been employed as an instructor in Civil and Structural engineering by the University of Wisconsin Extension Division at Madison. He is attending some classes in the University and is living at 824 West Johnson street, Madison, Wisconsin.

Janicki, Leo C., has been employed in the Materials Testing Laboratory of the city of Milwaukee. He is living at 877 Weil street, Milwaukee, Wisconsin.

Johnson, Page, has located as a foreman for the Atlas Company, contractors. At present he is working on the construction of tar macadam roads in a large subdivision on the south side of Chicago. His residence address is 1850 Cedar Road, Homewood, Illinois.

Junkerman, Charles G., has been employed as an inspector on a survey party of the United States War Department Corps of Engineers. At present Junkerman is located on the survey of the Menomonie river. His address is 625 Summit avenue, Milwaukee, Wisconsin.

Kulp, John H., who during the latter part of the summer was married to Helen L. Parker, daughter of Mr. and Mrs. E. D. Parker of Madison, is going through the test course of the Michigan Bell Telephone Company of Detroit. His residence address is 1927 Pingree avenue, Detroit, Mich.

Lovewell, Cecil E., who was in charge of the surveying instruments at the summer survey camp, has been working on a sewer job at Akron, Ohio. Bad luck met him when he entered Akron as his car was badly smashed up the first day he was in town. On August 10 he landed in St. Thomas hospital where he stayed for seven weeks nursing a leg that was badly injured as a result of a bank caving and throwing him in an elevating grader. The machine ripped the skin off of his right leg from ankle to groin but did not tear the muscles. Skin grafting was necessary. At present he is at home recuperating. "Cec" has recently received an offer of a position in the cement testing laboratories of the Bureau of Standards at Washington, District of Columbia. Lovewell's home address is 428 Maplewood avenue, Toledo, Ohio.

Lucht, Harold C., has located with the American Appraisal Company of Milwaukee and wishes his mail addressed to Route 4, Box 47 C, Kenosha, Wisconsin.

Oakey, John A., has accepted a position as instructor at the Agricultural and Mechanical College of Texas at College Station, Texas. Oakey is instructing in elementary mathematics, elementary mechanics, and slide rule.

Peppard, Thomas D., has located with the Federal Bureau of Public Roads as Junior Highway Engineer. At present Tom is making cost production studies on road building. Mail addressed in care of the Bureau of Public Roads at Washington, District of Columbia, will eventually reach Peppard.

Pratt, Leo F., has located with the Interstate Commerce Commission as Junior Civil Engineer, Bureau of Valuation. Leo can be reached by writing to room 523—1736 G street N. W., Washington, District of Columbia.

Ward, Gerald C., after working all summer in the engineering department of the Chicago and Northwestern Railway, is back on the job at the University, teaching Railway Curves and Earthworks to the unsuspecting Sophomores. "Gerry" is living at 1316 West Dayton street, Madison, Wis.

Wehrle, Otto W., has been awarded a fellowship in the department of mechanics and plans to take his masters work during the school year. Otto is living at 108 Langdon street, Madison, Wisconsin.

Woo, William H. F., has enrolled for graduate work at the University and is living at 612 Dayton street, Madison, Wisconsin.

Ziehlsdorff, Walter C., is now a testing engineer in the materials department of the Wisconsin Highway Commission at Madison, Wisconsin. His residence address is 530 Clemans avenue, Madison, Wis.

CHEMICALS

Barton, Clare A., has located with the Grasselli Chemical Company as chemist and process man. Most of Barton's work is in analytical inorganic chemistry. His address is 748 Westfield avenue, Elizabeth, New Jersey.

Ceaglske, Norman H., has located with the Wisconsin Gas and Electric Company at Racine. His address is 1928 Green street, Racine, Wisconsin.

Fowle, Merill J., after finishing the training course was employed as a chemist in the explosives division of the E. J. Du Pont Corporation at Gibbstown, New Jersey. His address is 42 Delaware street, Woodbury, New Jersey.

Garvens, Howard L., has been employed as electro-chemical engineer by the United Chromium Corporation of Chicago. Garvens expects to be transferred to the newly opened Milwaukee plant soon, so mail addressed to 253 St. Charles street, Wauwatosa, Wisconsin, will be sure to reach him.

Gross, J. F., is employed by the Grasselli Chemical Company at East Chicago, Indiana.

Gustafson, H. W., is with the Gisholt Machine Company of Madison, Wisconsin.

Martin, J. E., is located with the Northern Paper Mills at Green Bay, Wisconsin.

Kuehl, Carl, is attending Columbia University as a graduate student in Chemical Engineering and Food Chemistry. His address is 612 Furnwald Hall, Columbia University, New York City, New York.

McFarlane, Robert W., is a cadet engineer with the American Tar Products Company of Chicago. His address is 6848 — 30th street, Berwyn, Illinois.

McGovern, John N., is now a fellow and a graduate student in the Forest Products Laboratory at Madison, Wis.

Ragatz, Eugene, is at present an instructor in the chemical engineering department of the University of Wisconsin. He is living at 140 West Gilman street, Madison, Wisconsin.

Rick, Thad T., has been employed as Junior Chemical engineer in the Industrial Engineering division of the DuPont De Nemours and Company at Parlin, New Jersey. His address is 32 Codwise avenue, New Brunswick, New Jersey.

ELECTRICALS

Agan, James B., is at present a technical student in the training course of the Long Lines department of the American Telegraph and Telephone Company. Agan can be reached in care of the above company at 208 W. Washington street, Chicago, Illinois.

Ajer, Oliver, who after leaving school toured northern Wisconsin and Canada with his wife, is now located in the radio transmission department of the General Electric Company at Schenectady. Previous to September 16 Ajer was working in the radio production of R66 receiver. His permanent address is 144 Mohawk avenue, Scotia, New York.

Bussel, Cecil W., is with the General Railway Signal Company at their Leavenworth, Kansas, branch. During the past summer Mr. Bussel has been traveling over the state of Kansas installing signals. He may be reached for the present at the Willard Hotel in Leavenworth, Kansas.

Campbell, Charles J., is now in charge of the engineering department of the Hankscraft Company of Madison, Wisconsin. Mr. Campbell has already developed several articles which are on the market and has for the last few months been interested in developing machinery to speed up production. He is living at 124 N. Charter street, Madison, Wisconsin.

Curran, George W., who spent the summer in Los Angeles instructing in the radio school of the Y. M. C. A. and who was married, while in Los Angeles, to Mabel Errickson, L & S '28, is now taking graduate work in the University of Wisconsin and is chief operator of the University radio station WHA. The couple's present address is 215 North Mills street, Madison, Wisconsin.

Drake, Leslie P., is now a Protection Inspector for the Wisconsin Telephone Company of Milwaukee. His work entails the writing of reports of damage to telephone plants by lightning and foreign currents from power wires. His residence address is 174 East State street, Milwaukee, Wis.

Field, Louise O., the first girl to graduate from the electrical engineering course at Wisconsin, is now employed by the Wisconsin Power and Light Company in their General Engineering department. Miss Field is at present working on insulator tests and the percentage failure of insulators in high tension lines.

Fischer, N. J., has been employed as field engineer by the T. M. E. R. & L. Company of Milwaukee. "Nate's" address is 1521 Kilbourn avenue, Milwaukee, Wisconsin.

Foss, Clifton, has been employed as engineer in the Research and Development department of the International Telephone and Telegraph corporation at 67 Broad street, New York City, New York. His present residence address is 548 W. 113 street, New York City, New York.

Garlock, Robert G., has been employed as an engineer in the apparatus analysis department of the Bell Telephone laboratories at New York City, New York. Garlock can be reached by writing 404 West 116 street, Apartment 32, New York City, New York.

Goldstein, M. N., has been employed as a student engineer with the Wagner Electric Company of St. Louis. Goldstein's work has consisted of a complete tour of the plant with a month in each of its departments. At present Goldstein is living at 1232 Oakley Place, St. Louis, Missouri.

Horsfall, Joseph David, has located with the Ohio Bell Telephone Company at Cleveland. His present title is Installer and Central Office Helper. Mail addressed to 1406 Lake Road, Avon Lake, Ohio, will reach Mr. Horsfall.

Buechner, Norman R., is an ensign in the United States Naval Reserve Corps. He is at present stationed at the Naval Air Station at Pensacola, Florida. According to the latest information available Norman and Mrs. Buechner are becoming acquainted with the insect pests of Florida when they are not dodging alligators. Noah was all wrong when he took these pests on the ark according to Buechner.

Jewell, Richard G., has entered the service of the General Electric Company at Schenectady. Along with his test work Jewell is taking the advanced course in engineering offered by the company. His residence address is 429 Third street, Schenectady, New York.

Lewis, Sanford A., who is now employed as an engineer for the Michigan Bell Telephone Company at Detroit was married on June 13 to Louise M. Clements. The couple spent their honeymoon in Canada and the eastern states, after which Mr. Lewis took over his new position. Mr. and Mrs. Lewis are now at home at 2211 Pimgree avenue, Detroit, Michigan.

(Continued on page 28)

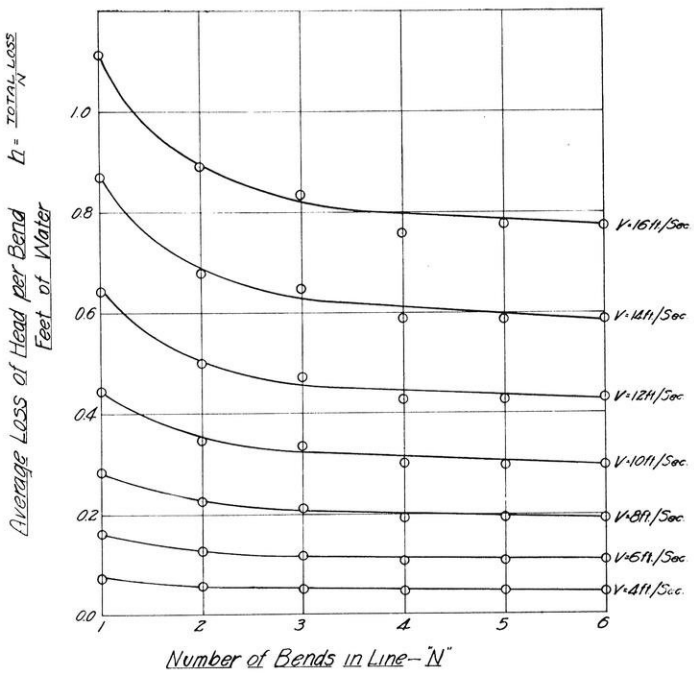
A Thesis Study on

The Distribution of Friction Losses in Pipe Bends

By LAWRENCE J. BECK, c'29

AMONG the research studies which have been carried on at the Hydraulic Laboratory of the University of Wisconsin have been the losses in head in various fittings as described in two of the bulletins published by the Laboratory* In the compiliation of the data in the bulletins, the late Professor C. I. Corp became interested in the actual distribution of the losses in a fitting, and the first of a series of tests started under his direction to determine this distribution over a range of sizes and types of bends and valves has been completed.

It has been recognized for some time that the loss of energy due to a fitting in a pipe line over and above the pipe friction loss is made up of two parts, a loss in the fitting itself where the normal conditions of flow in a straight pipe are disturbed, and a loss in the downstream pipe where the distorted flow causes an additional loss in energy to a point where the irregular flow is dissipated. However, no information concerning the magnitude of the separate portions of the losses in fittings has been available.



These curves show the relation between the average loss per bend for 2-inch Flanged Cast Iron bends at various heads and velocities.

The first tests have been made on two inch standard cast iron bends with flanged joints. The nature of the experiments was to determine the total losses in head for each of a series of velocities of flow occasioned in a certain gauge length of pipe into which was inserted a number of bends, singly, and in groups of 2, 3, 4, 5, and 6, to form a continuous series of "S"-bends without connecting spacers. The net bend loss was found to be the difference between the total loss and the pipe friction loss in the centerline length. The net bend losses were then studied to determine the nature of the individual losses and the effect of the various groupings of bends.

As a result of the studies it was found that the average loss of head per bend decreases as successive bends are added in line as shown, and becomes approximately constant and equal to about two-thirds of the loss of a single bend, after the fourth bend has been inserted. Expressed as percent of the loss of a single bend the following comparison was found to obtain at all velocities of flow:

1 bend 100.0%.

2 bends 78.6% for each bend and for 2 bends = 157.2%.

3 bends 73.7% for each bend and for 3 bends = 221.1%.

4 bends 67.1% for each bend and for 4 bends = 268.4%.

5 bends 67.8% for each bend and for 5 bends = 349.0%.

6 bends 67.6% for each bend and for 6 bends = 405.6%.

The experimental data indicates that the value given for 4 bends is somewhat low. An analysis of the data also indicated that the increment in total loss upon the addition of the second and each subsequent bend to form a continuous series of "S"-bends is approximately 60 percent of the loss of a single bend.

It was further concluded that within the limits covered by the tests, the net bend loss is so distributed that 60 percent of the loss occurs in the bend itself where the disturbance is set up, and 40 percent in the downstream pipe where the conditions of flow in a straight pipe are reestablished.

*Engineering Experiment Station Bulletin No. 1, Vol. IX — Experiments on less of head in valves and pipes ½ to 12 inches diameter by C. I. Corp and R. O. Ruble. No. 66—Experiments on less of head in U. S. and Twisted pipe bends by C. I. Corp and H. T. Hartwell.

The Advantages of Test Experience Are Not All Technical

By R. C. MUIR, e'05

I HAD gone along some twenty years with the General Electric Company quite blissfully, as it were, considering myself one of the youngsters notwithstanding the fact that I was meeting and interviewing, from day to day, many of the young men in, or just through, the Test. Then suddenly it dawned on me that some of the young men were showing me a little more respect than they were to their contemporaries and that the chances were they were referring to me as "Old Man Muir" when talking among themselves, reorganizing the Company or something of the sort. Now, I am still a youngster as compared to many of our still active men of the Company, and it is human nature to overlook the passing years and to consider yourself and those who have come along with you, only a little older, at most, than when you were on Test. Nevertheless, disregarding how young you feel, you are to the Test man just what the Test men think you are; and while I will not admit for one moment that I am at the age where I should be reminiscent, I have agreed to indulge in reminiscences to a slight degree.

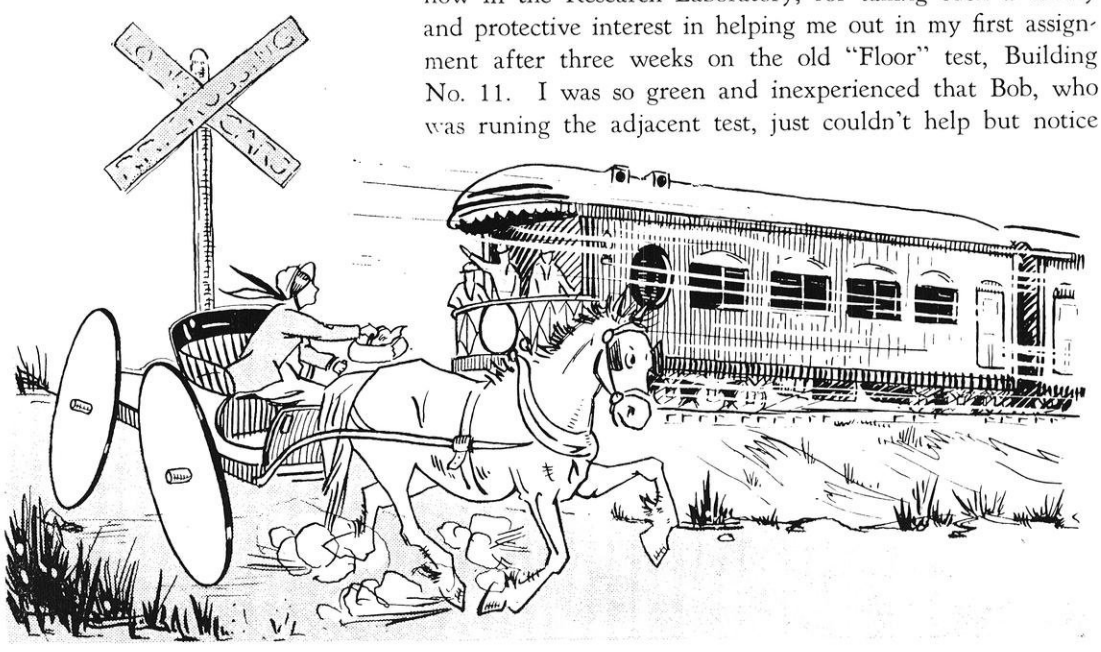
Looking back on my Test experience of two years, 1905 to 1907, the one thing I probably value most highly is the friends I made; but from a business point of view the two outstanding benefits were confidence in my ability to do things, and the association with men of all types of personalities with whom I have since come into contact in business life. It is to emphasize this point that I shall tell of a few of my experiences, and a few of the individuals for whom I hold a very high regard will be mentioned by name.

As the train pulled out of Madison, Wisconsin, John Price, "Hap" Ward and I stood on the observation platform and saw "Hap's" mother urging along the old gray mare down the hill so as to bid us goodbye, and — even more important — to give us a basket containing fried chicken and other delicious things intended to keep us from starving the next day. We did miss that lunch. And how! Notwithstanding the fact that John and I shared an upper from Chicago to Cleveland and day-coached from there on, it was a jolly trip. "Hap" had an upper all to himself to Cleveland—he was a rich guy. But anything either of them had was also mine, as far as it went.

We arrived in Schenectady about 1:30 o'clock Saturday morning and were met at the train at that early hour by L. R. Brown ("Big Buster") and Max Whiting, opposites in personalities but both with the basic qualities of unselfishness and self sacrifice. Brown was intensely interested in the commercial phases of our business and we marveled at the manner in which the names of Lovejoy, Barry, Bullen and Haskins slipped off his tongue as glibly as if he were a personal assistant to all of them. His present position indicates that he maintained his interest in commercial matters. Whiting, on the other hand, looked upon the commercial organization as a necessary evil, but his interest was entirely engineering. He has maintained his interest in engineering, although he has acquired a pronounced commercial point of view.

That first day we were given an example of good fellowship. Price and I were permitted to play on the Edison Club baseball team along with such stars as Brobst, Beckert, Diesem, Weber, Tenney, Rohrbach and Dorticos ("Hap" was a rooter), and in the evening were taken in as one of the Test family at the customary Saturday night party at the Holland Inn.

I shall always have a grateful feeling for Bob Palmer, now in the Research Laboratory, for taking such a kindly and protective interest in helping me out in my first assignment after three weeks on the old "Floor" test, Building No. 11. I was so green and inexperienced that Bob, who was runing the adjacent test, just couldn't help but notice



Schenectady Bound! Old Dobbin ran a noble race, but—

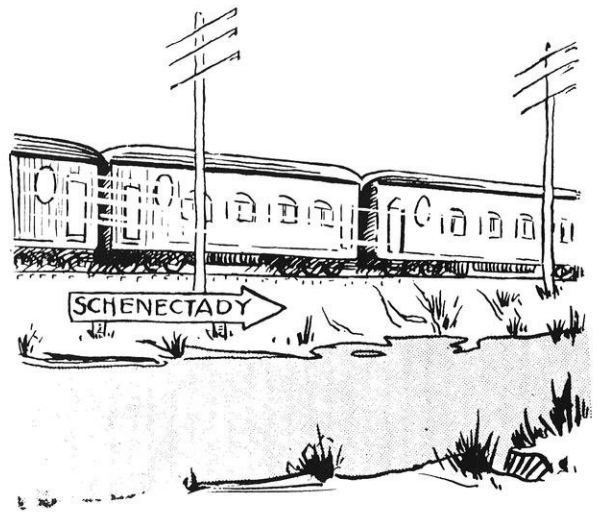
it and, of his own initiative, gave me the helping hand, showed me how to make out the test record, and aided me otherwise. Neither will I ever forget how, after shorting a big d-c. machine, Bill Shreve, then assistant on 16 Test, slapped me on the back and said, "Now don't mind that, young fellow; let's find out what's the matter."

Somehow, you always found this type in Test when you were in difficulty. It was not sympathy they offered, but something that put you at ease and made you try your best to do a better job.

Then there were those, usually your very close friends, who accomplished much the same thing by keeping you on your mettle by "kidding" you. When I shorted this d-c. machine, Bill Veeder, then head of 16 Test, immediately telephoned to Jack Brobst, with whom I was living, and asked Jack to raise the devil with me for blowing the shop. Jack lost no time in doing so. He couldn't even wait for me to get home, but rushed down from Building 11 immediately; and still, if I were in any real difficulty, I could have pledged my life that Jack and Bill would be on hand to help me out.

It was this same Bill Veeder—who, incidentally, always put an awful lot up to me on 16 Test—who was willing to go to the extreme to protect you if he thought it was right to do so, as the following incident will show.

He gave me a couple of "farmers" one night to help compound two large d-c. three-wire generators which were coupled together and driven through a 14-inch belt by a large d-c. motor. Each time we shut down there were four shunts to adjust and I was having good luck; just one more trial before midnight supper and I would have it. I rushed over and slammed in the breaker and the switch was in. The belt went traveling up the shop and every breaker back to Dock Street blew. The farmers, on speed and water box, both woke up. Billy came rushing up and asked what had happened, and I told him I had



The lunch was left behind!

closed the breaker on the switch. He cussed out the farmers a little and told them to dilute the water box and called up Freddy Reed and told him to get some lacers down there right away; that the shop had gone off and this big motor had pumped back and broken the belt. Billy Veeder wanted the truth and if a little prevarication were needed, he could do it himself.

C. C. McDowell didn't enjoy his sojourn in 16 Test as much as some of us. We were all taught to do the job we were on well, even though it might be trivial and distateful. The future would then take care of itself, but it didn't work out that way for Mac. He did so well holding speed the first night in 16 they kept him at it the better part of three months. I also learned on 16 Test that one should be considerate of his fellows. Mac often tells how he was ready to brain one of his best friends, C. C. Batchelder, with one of those short, heavy, cable connectors because "Batch" in his enthusiasm and absentmindedness kept Mac on speed for 12 hours straight with only a half-hour let-up for mid-night lunch.

"Batch" was an investigator. He always had to have an explanation. He was camping with Dr. Steinmetz up on the Mohawk that summer, and honored me with an invitation one night. When we arrived he started for the adjacent farm house to procure milk and waxed enthusiastic about its freshness.

"Hap" did the rooting!

"Why, you know," said he, "it's always fresh. I think they must milk some of the cows at night and some in the morning." He was reared in the city. His explanation wasn't right in this case, but he was a fine example of a man who thought things out.

George F. Brown ("Little Buster") was our example of neatness. Without question he was the best and neatest wireman on the Test. Everyone liked to work with "Little Buster," as he insisted on doing all the wiring himself while others usually preferred to get meters, rheostats, and do the odd jobs. Incidentally, he was an expert at billiards, as I have good reason to remember.

The association with men from other countries had a beneficial and broadening effect. A mere introduction to the dynamic Bill Reece from New Zealand was stimulating. Pat Close from Australia will be remembered by all his Test associates for his good fellowship and his songs, and R. Greatbatch, the play boy from South Africa, for his practical jokes in Test. And so, with men from other countries, each played a part in enriching one's Test experience.

Many of the Test men of 1906 and thereabouts undoubtedly sympathize with present Test men when they recall the A. I. E. E. smokers in Red Men's hall when we sat around the table and enjoyed a stein with Dr. Steinmetz and other outstanding men of the Company, when "Bony" Atkinson staged the light house scene from "Shore Acres," Tommy Thompson recited George Ade's fables, and Pat Close sand his most famous song, "I've Got the Ooperzootic."

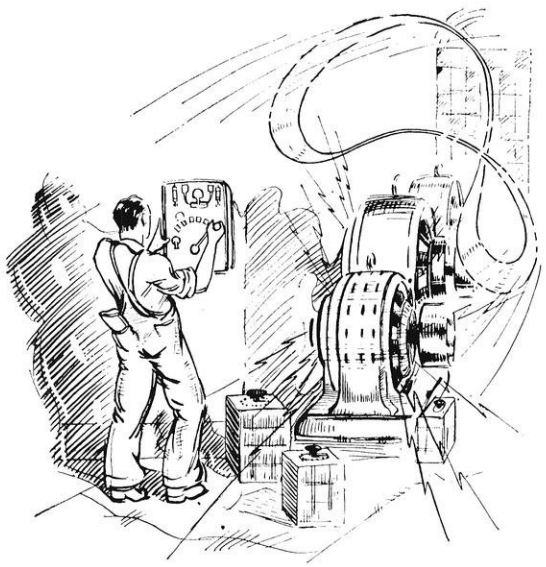
It just wouldn't do to write this article without mentioning "Cap Kidd" from Oklahoma, dearly beloved by every Test man he knew. He was gifted with a rare Western humor that couldn't be resisted. He was in the

habit of shaving about once a week, if he found it convenient, even though he had a very heavy beard. As a result, the gateman held him up several times, but that didn't worry "Cap." One night "Cap" was sitting on one of those high tables we had in 16, holding speed on a large rotary. No readings were being taken for a while and "Cap" dozed off. Suddenly the rotary flashed over, fairly in his face. Edleman had shorted the dynamometer board. "Cap" just rolled over backward and fortunately came down on his feet, only to fall over again. He gathered himself up and slowly swayed over to the dynamometer board and drawled: "Edleman, I've a good notion to thrash you. I didn't mind the fall but I sure hated to swallow that chaw of tobacco."

Those of us on night test, not accustomed to chewing tobacco, took it up temporarily, as it enabled us to keep awake.

As assistant to Jack Harnden in Turbine Test, I began to learn something of the ways of the high and mighty engineers, and from Jack, some of the principles of a good executive. H. E. Plank was also an assistant, and being athletically inclined, he was always pulling some stunt to show his prowess as a strong man. Recently I was down in the turbine shop and met old "Dan." After an exchange of greetings he asked me where my strong friend was—"You know, the fellow who used to roll up his sleeves and show how much muscle he had."

"Hap," Jack and I were a happy family for a matter of a year. It was at a time when turbine development



The belt went traveling up the shop—

was just well under way and something was wrong with nearly every machine. It was a hard task, with plenty of responsibility; but once out of 60, we shed our worries for a night and walked up through the yard and on up Dock Street with Jack in the middle. "Hap" and I would gradually increase the stride until pudgy Jack was literally throwing out his feet and going after them. Then he would get to the limit of his stride and cuss us out, and we would start in and do it all over again.

I could write a book on my Test experience. I have only touched a few of the high spots; but possibly I have written enough to bring out the pleasures and advantages of associations in Test. I regret I have not the space to mention some of the pleasant experiences with a hundred or more others but will take this opportunity of sending my greetings to them.

To those whose names are mentioned, I shall not only send my greetings, but my apoligies for having taken the liberty of making comments of a personal nature.

And woke up every "farmer!"

EDITOR'S NOTE—To us, who are still in school, 1905 is way back in the dim and distant past. Men of that class and of classes before and after have been at work in engineering longer than most of us have been living. We welcome their stories of their experiences with eager attention, believing that their experiences will, to a large extent, be our experiences. Their work and play is of absorbing interest to us, their success is an inspiration to us and their stories mark out new paths of engineering progress which help us to choose our own.

The Wisconsin Engineer is fundamentally a student magazine, published by students and for students. One of the finest opportunities of such a magazine is to inspire undergraduates to take profit and pleasure in the life work which they have chosen, and one of the best ways of taking advantage of that opportunity is to present to them the experiences of some of our successful alumni. Everyone is somewhat reluctant to write about himself, but, when it is the means of helping out newcomers in his field to more profitably enjoy the life of engineering service to which they are being trained, it becomes a duty.

We respect our alumni and wish you continued success. We also ask that you pass on to us the story of your work that we may realize more the difficulties of our profession and how we may avoid them. The WISCONSIN ENGINEER is waiting to hear from you.

Alumni Notes

By R. L. VAN HAGAN, c'32

Wisconsin Man Appointed Chief Topographic Engineer for United States Geological Survey

On September 10, John G. Staack, '04, was appointed chief topographic engineer for the U. S. Geological Survey. He will be chief administrator and technologic officer of the topographic branch of the Survey and will direct all of its topographic surveying activities which are expanding rapidly and promise to be of great importance during the next decade.

Jack, as he is commonly called, was a farm boy from Middleton, Wisconsin, where he was born November 19, 1878. He was graduated from the Platteville State Teachers College in 1900 and from the course in civil engineering at the University of Wisconsin in 1904, being a class-mate of Professors Kinne, Owen, and Van Hagan.

He began work with the U. S. Geological Survey on July 1, 1904, and has served through all of the grades from field assistant on up. His work has all been within the continental United States, much of it within Wisconsin. He is the author of a large number of topographic maps.

Jack was married on December 26, 1911, to Lenore Jones of Platteville.

J. G. STAACK

The wedding took place at Spokane, Washington, where Miss Jones was teaching in the public schools. They have one child, Elizabeth Roberts, aged 11.

Topographic engineers were at a premium during the war. Jack was commissioned a captain in the Engineer Officers Reserve Corps on April 16, 1917, and was assigned to active duty in military mapping, which occupied him until he was honorably discharged in March, 1919. His work was all in the United States, ranging from New Mexico to Virginia.

For three years, 1922, 23, and 24, Jack was detailed by the Survey to act as instructor in plane table surveying at the summer survey camp at Devils Lake, a task at which he was highly successful. There was a sincere regret at the camp on the part of both faculty and students when the press of business became to great for him to continue this work.

Jack is a member of the American Society of Civil Engineers, the Society of American Military Engineers, and the Washington Society of Engineers. Members of our student chapter of A. S. C. E. will be interested in knowing that he was one of the five men chiefly instrumental in founding, in 1902, the old Civil Engineering Society, which later became affiliated with the national professional society.

CHEMICALS

Baxter, Robert A., ch'19, Ch. E.'26, is assistant professor of chemistry at the Colorado School of Mines, Golden, Colo.

Ceaglske, N. H., ch'28, M. S.'29, is working with the Wisconsin Gas and Electric Co. in Racine, Wis.

Colburn, Allan P., ch'26, Ph. D.'29, is in the fundamental research division of the Du Pont Corporation at Wilmington, Delaware.

Eastwood, P. R., ch'28, M. S.'29, is at present assistant engineer in the Forest Products Laboratory at Madison.

Golley, Frank B., ch'22, is assistant superintendent of the blooming mill of the Wisconsin Steel Corporation at South Chicago. Address: 2143 East 72nd Street, Chicago, Ill.

Herro, Alex C., ch'28, is with the chemical laboratory of the Carnation Milk Products Company, Oconomowoc, Wis.

Hiemke, Hugo W., ch'26, is sales engineer for the Weimer Welding Company, Milwaukee, Wisconsin.

McFarlane, D. J., ch'27, is in the lubricating division of the Standard Oil Company of New Jersey, at Elizabeth, N. J.

Manthey, R. H., ch'24, is in the carbon brush division of the National Carbon Company, Cleveland, Ohio.

Norris, Ralph F., ch'15, has recently been granted a patent for a system of acoustics and for sound deadening construction.

Storey, Oliver W., ch'10, metallurgical engineer for the C. F. Burgess Laboratories in Madison, was elected vice-president of the American Electro-chemical Society at a meeting held in Toronto last July.

ELECTRICALS

Courtenay, Bentley, e'26, is now attorney with the firm of Stern, Holmes, Murphy, Courtenay and O'Brien of Milwaukee. His business address is 97 E. Wisconsin Ave., Milwaukee.

Fuldner, Walter H., e'28, writes in a letter to one of the faculty: "At present I'm assistant to the personnel director and superintendent of Gimbel's Milwaukee store. On first thought it would appear that I've forsaken the sons of St. Pat; I haven't, for now I deal with people instead of volts and amps. It's the same thing in the long run."

Krippner, A. F., e'04, is at the head of a machinery and supply company at 1429 18th Street, Denver, Colo.

Norton, Paul T., e'17, who has been assistant professor of mechanics here since 1926, is now professor of industrial engineering at Virginia Polytechnic Institute, Blacksburg, Va. One of the important duties of his new faculty post will be to direct the recently created bureau of industrial service, which has been organized to pave the services of the engineering school at the service of industry through technical advice and information.

Roberts, Hubert H., e'28, was married on September 23 to Miss Eva Mae Martin at Richland Center, Wisconsin.

Wolfe, Harry C., e'26, will be sales manager for the U. S. Chromium Corporation, 1100 Pitt Ave.. Wilkinsburg Station, Pittsburgh. Address: 121 Carnegie Place, Pittsburgh, Pennsylvania.

MECHANICALS

Hanson, Earl, m'22, spoke to the students of the college on May 28 upon the subject: "An Engineer's Experiences in Iceland." Hanson, since his graduation, has spent his time largely in travel and exploratio and has written extensively. He is now making a trip to the Hudson Bay region.

McMillan, Luther B., M. S. in M. E.'14, and instructor in Steam and Gas Engineering from 1914 to 1916, died August 10 from injuries received in the crash of his private airplane at the Newark airport. As chief engineer of the Johns-Manville Company he owned and used two monoplanes to carry him between his headquarters in Chicago and the cities of Los Angeles, Portland, Seattle, Salt Lake City and other points. He was a pilot. Mr. McMillan did his undergraduate work at Texas A and M College. He was a fellow at Wisconsin in 1913 and 14 and did his research work in the field of heat transmission through insulation materials.

CIVILS

Dames, Erwin, c'20, former city engineer of San Mateo, Calif., has been appointed city manager and city engineer of Pacific Grove, Calif. Mr. Dames has been engaged in various phases of municipal work since 1920, and was at one time superintendent of public works at Winnetka, Ill.

Farwell, K. D., c'24, is field engineer for the Indiana Limestone Co. He gives his business address as 15 E. 41st St., New York City.

Glaettli, John, Jr., c'09, has been appointed assistant supervisor in the construction of West High School, Madison. Mr. Glaettli is an engineer and contractor in Madison.

Landwehr, Edgar A., c'27, former instructor in Railway Engineering, is in the valuation department of the St. Louis Public Service Company at St. Louis, Md. Address: 3939 Castleman Ave.

Landwehr, Waldemar J., c'25, who is an engineer with Mead & Searstone, was married on August 17 to Jessie Corinne Sutcliffe.

Laurgaard, Olaf, c'03, CE'14, city engineer of Portland, Oregon, has been reappointed by Governor Patterson, of Oregon, as a member of the State Board of Engineering Examiners. The appointment is for six years.

Liddle, George F., c'27, is in private practice in Muskegon, Michigan, having passed the examinations and been registered as an engineer in that state. He reports a busy summer, his most important job being the construction of a joint city and county drain project. Address: 382 Prospect St., Muskegon.

Loverud, Earl K., c'23, recently left on a tour through the Orient in the interests of the Pawling Harnischfeger Company of Milwaukee.

McMullen, Ralph E., c'27, spent the summer in northern Wisconsin fishing and camping in an effort to regain his health that had suffered as the result of an auto accident. He reports from Pendleton, Oregon, where he had motored to see the round-up, that he is now fit and hoping to land a job in the West, which he has found much to his liking.

Prochaska, Victor H., c'27, was married last June to Miss Velma Emery of Madison.

Schustedt, Frederick N., c'17, who has been an assistant engineer in the city engineering department of Madison, has resigned to become an airport engineer for Leonard Macomber, Inc., of Chicago. He will be one of two engineers employed by the company in designing and developing airports.

Smith, Leonard S., c'90, C. E.'95, former professor of Highway Engineering at Wisconsin, has rented his Beverly Hills home for a year and has moved to a new home in Hollywood Riveria, a new development on the Pacific ocean. Mr. Smith is actively engaged in making plans for the new developments. His mailing address is Redondo Beach, Box 394, California.

Yonker, Carl C., c'28, was married on May 25th to Miss lsie Lunn of Colfax. Carl is an engineer in Division 1 of the Wisconsin Highway Commission. The couple will make their home at 1124 E. Gorham street, Madison.

Abendroth, George H., c'25, former instructor in railway engineering and recently engineer with the Dravo Company of Pittsburgh, is now in the designing department of Worden-Allen Company of Milwaukee. He is also teaching some structural engineering courses in the Milwaukee Extension. Address: 1723 Humboldt Ave.

Zola, Stanley P., c'27, is with the Great Lakes Dredge and Dock Co. of Milwaukee. Address: 1303 Cedar Street, Apt. F, Milwaukee, Wis.

Engineering Review

1,800,000 WATTS OF ELECTRIC POWER USED TO ILLUMINATE THE LARGEST ROOM IN THE WORLD

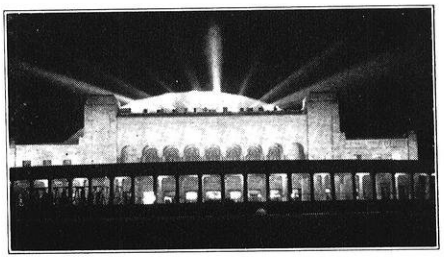
In order that the Atlantic City Convention Hall, the largest room in the world, which can seat 40,000 people, should be properly illuminated, one of the lighting equipment companies has designed and built a special lay-out and system of light control to conform with the consulting engineer's requirements so that the lighting for this building can be governed from a central point by a minimum number of operators.

The light control system consists of approximately 275 circuits for the main auditorium, ballroom, and the lighting for the exterior of the building. These circuits vary in wattage from the 100 watt trouble lamp in the hands of the workman to the maximum 30,000 watts on the floodlights on the trusses in the main auditorium. Approximately 1,800,000 watts of electric power are used in order to provide light in this hall, which is more than ample to meet the lighting needs of a community of 10,000 people.

Located on the boardwalk, with the Atlantic ocean for its front yard, the Atlantic City Convention Hall, a city in itself, is an institution which is commanding the interest of engineers throughout the country. Within its walls are theatres, ballroom, auditorium, bath houses and a garage for parking 400 cars. Practically everything needed by mankind except sleeping accommodations is furnished.

Built at a cost of $10,000,000 and operated by the municipal government with the aid of a citizen's commission, this building covers an entire city block 350 feet wide by 650 feet deep. Some idea of the tremendous size of this Hall can be gleaned from the fact that although the main auditorium will seat comfortably 40,000 people and another 5,000 can be accommodated in the ballroom, the entire permanent 66,000 population of Atlantic City can be seated in the building and there will still be room to spare.

The roof of the main auditorium, which is 135 feet above the floor at its highest point is supported by ten pairs of three hinge trusses weighing 220 tons per pair. These trusses have a clear span of 350 feet and are said to be the largest ever erected in a building of a permanent nature. Inside the trusses which are 12 feet wide, large enough for a man to climb a ladder which extends their entire length, are placed 540 — 1500



The Atlantic City Convention Hall.

floodlight projectors which are spaced 14 feet apart. The projectors for the auditorium lighting are controlled by what is known as a five-scene multi-preset switchboard and it is possible for the operator to set up in advance five separate and distinct lighting effects and throw them on at the proper time by the operation of a single master switch.

In order to provide the various colors in white, amber, red and blue, another lighting equipment company designed the color screens and mechanism that are used for the individual floodlights rather than the employing of a floodlight for each color.

To provide further flexibility for this unusual lighting control, switches are provided whereby in the auditorium five distinct color combinations may be set up on the floodlights. By means of indicating lamps on the switchboard, the operator is able to tell at all times which color screen is in position in front of the floodlights both in the auditorium and on the exterior of the building.

Without this control apparatus, a human hand would have to make and break an electric contact every few seconds, and time its work perfectly. No one operator could possibly run off the amazing array of color effects at the Atlantic City Convention Hall without the help of the pre-set control system.

Further combinations of lighting may be obtained by combining two or more of the lighting effects set up for an individual scene. In addition to being able to set up for an individual scene. In adition to being able to set up the scenes in advance, individual control is provided for each of the lighting circuits and they in turn are controlled through a master switch so that the individual colors may be controlled by a color master.

This arrangement allows the operator to throw off or on one color in an effect without disturbing the other parts of the illumination.

It is the opinion of America's foremost illuminating engineers, that those visiting the Atlantic City Convention Hall will see a spectacle of indoor and outdoor lighting never before approached.

For the stage lighting, a similar multi present switchboard will be used with the exception that it will be possible to set ten scenes in advance instead of five as used on the auditorium board.

The switchboard equipment used for the control of light for this building is the same as that by which the wonderful scenic lighting and various stage effects are produced in the modern theatre of today, and is divided into three main divisions consisting of main auditorium, ballroom, and exterior lighting. Due to the enormous size of the equipment necessary for the control of the main auditorium, this switchboard was divided into two sections, one of which is used for the control of the stage lighting, and the other for the control of the auditorium proper. The control of the lighting in question is from a pilot board, where the entire control for the lighting circuits is centralized at a point from which location the operator can throw on any desired lighting effect, and also control the intensity of the illumination.

The lighting of the Convention Hall ballroom, which is on the ocean side

of the building, is accomplished by Cove and Lunette method of direct color and general illumination. The ceiling of the ballroom is 90 feet high One hundred thirty-six floodlights of the 250 watt size equipped with Macbeth Whitelite lenses are set in arches and covers in this room. The Cove Lighting reflectors all have color screens of red, blue and amber which allow any decorative color scheme required.

In a building of this size, the heating and ventilating requirements are unusual. The same air which ventilates the main auditorium and ballroom is used for heat, provision being made for re-circulation. Direct radiation is used in the main and side entrances of the building and is supplied by re-circulating air-warming units. Offices, stores, corridors, stairways and other parts of the building exclusive of the main hall and ballroom are served by direct radiation. Pumps are provided for maintaining the vacuum required in the heating return and for the disposal of air condensation. Temperature is regulated automatically throughout the building.

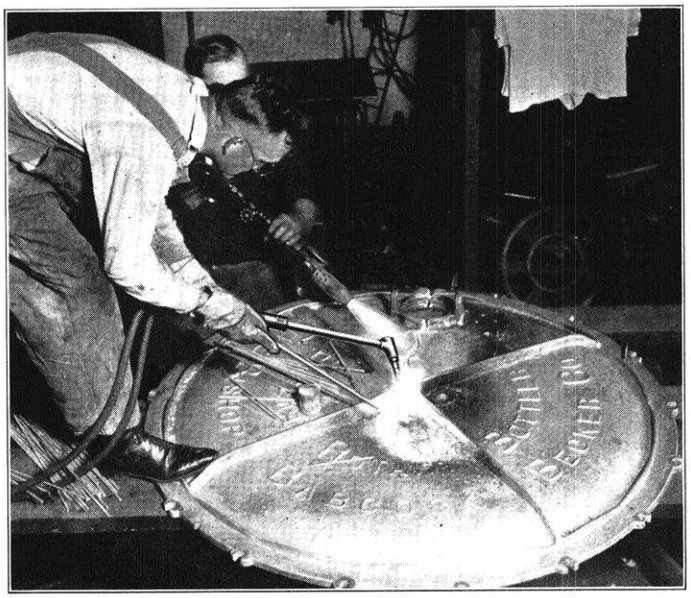
Ventilation is provided for by 31 motor-driven fans which have a capacity of 1600 tons of air an hour and 2900 tons of air are distributed throughout the building every hour by 75 fans. Seventy-two per cent of the air supplied to the buildings is for the main auditorium.

OXYWELDING ALUMINUM CASTINGS

In welding aluminum castings, it is usually recommended that the piece be carefully supported in the preheating furnace and preheated very slowly preparatory to the actual welding. Experienced aluminum welders, however, frequently dispense with the usual preheating furnace and handle even complicated jobs entirely with local preheating, using an oil burner for the purpose. The technique employed in this method is most interesting.

The illustration shows a welder at work on an aluminum casting 56-in. in diameter and ¾-in. thick, the lid of a rotary bottling machine, cracked from one edge about 20-in. toward the center. The expansion problem was fairly easy due to the circular shape of the casting, but is was complicated somewhat by a circular opening at one edge through which the crack passed, and by the fact that when the reinforcing ribs passed through the center bearing, the metal was considerably heavier there than elsewhere.

The lid had a crown of about 3-in. which increased the difficulty of penetrating the full thickness without forming projections of metal on the inside. This was to be avoided as it would necessitate extensive finishing. Although preheating the entire casting in a furnace was unnecessary, it would be desirable to heat it locally along the crack, just ahead of the welding flame, so the welding heat would not bring on too sudden a rise in temperature and cause further cracking.



Welding An Aluminum Casting.

Briefly the procedure was as follows: A steel plate was formed to fit the inside of the lid, and clamped to it along the crack. Then the whole casting was fastened to a flat surface and the two sides of the break were aligned at the open end by a steel strap clamped in position. Then the opening was veed carefully.

First the whole length of the break was heated slightly with an oil burner. Welding was then started at the inner end of the break, with the preheater heating the aluminum thoroughly a few inches ahead. To insure a sound weld, both a puddling rod and cast aluminum flux were used. The puddling rod was used to remove oxide from the surface of the molten weld metal. As work progressed the preheater was still kept playing along the break, always a little ahead of the welding flame. This opened the crack up to the limit of expansion. As sections of the break were finished a covering of asbestos paper was put on, and all during the work great care was taken to keep drafts and cool air from the work.

With these precautions the welding went ahead quite smoothly, in fact, the whole break 40-in. long was completed in about an hour and a half. The job required little finishing.

HE GOT THE JOB

In a letter of application, one must "sell" himself. Here is an application, some five hundred years old, by Leonardo da Vinci, the great artist. In spite of the apparent extravagance of the claims, he was able in every respect to "deliver the goods":

"Most Illustrious Lord: Having studied and estimated the works of the present inventors of warlike engines, I have found that in them there is nothing novel to distinguish them. I therefore force myself to address Your Excellency that I may disclose to you the secrets of my art.

"1st. I have a method for bridges, very light and very strong; easy of transport and incombustible.

"2nd. New means of destroying any fortress or castle (which hath not foundation hewn of solid rock) without the employment of bombards.

"3rd. Of making mines and passages, immediately and noiselessly, under ditches and streams.

"4th. I have designed irresistible protected chariots for the carrying of artillery against the enemy.

"5th. I can construct bombards, cannon, mortars, passavolanti: all new and very beautiful.

"6th. Likewise battering rams, machines for the casting of projectiles, and other astounding engines.

"7th. For sea-combats I have contrivances both offensive and defensive; ships whose sides repel stone and iron

(Continued on page 22)

Campus Notes

A. S. C. E.

The student chapter of A. S. C. E. began its year with a mixer held in the auditorium of the Engineering Building, Wednesday, October 2.

The program for the year, as announced, will consist of a series of lectures, discussions, and inspection trips. After a songfest of old varsity songs led by G. C. Ward, with L. H. Glaessner at the piano, the freshmen and old members were treated to cider and doughnuts.

THE BLOT

The blot's a drafting-room mistake that forms a puddle, pond or lake upon the tracing, when the mug — or bottle, jardiniere or jug — that holds that draftsman's ink, somehow gets upset on same—meeow! to make the rooster tear his kelp and hop around and yodel "HELP".

To get a blot upon one's sheet, when he has squirmed with prickly heat bent double on his trusty stool and toiled with compass, pen and rule day in, day out, for months perhaps, 'twixt moans and cusses, groans and gaps, to get a "perfect" drawing out, makes him as crazy as a trout!

Ah, well do we recall one day — 'twas on the 39th day of May—when, after six long weeks of work with slide rule, angle, pen and dirk, upon the floor plan of a cheese, we straightened up with heartfelt wheeze and viewed our masterpiece at last —complete! A work of art! Dodgast!

And then—odds Higgin's! raised our mitt, to brush the art gum crumbs off it, and quicker than a jaybird's wink kerplunked a beaker full of ink smack on the tracing's gleaming face, to flop and roll from place to place ere we could snare it with our square and give it what is called "the air"!

This is the reason draftmen's hay so early falls out or turns gray; the explanation of the fact that 88 per cent are cracked; why nine in almost every ten land in the poorhouse or the pen! (Which figures, though, we won't vouch for; but anyway, blots make one sore!)

—*Engineering News-Record.*

DEPARTMENTAL CHANGES

The staff changes in the different departments of the Engineering College are relatively few for the year 1929-1930.

L. W. Peleske takes the place of L. S. Baldwin in the drawing department and R. S. Parker fills the vacancy left by W. A. Werrell in the same department. E. Grant is a new addition to the staff of the drawing department.

W. W. Behm succeeds A. S. Zander as assistant in Highway Engineering.

Additions in the machine shops are Mr. Puddlester and J. B. Cluley.

New men in the mechanics department are H. G. Neale, L. O. Hanson, and Assistant Professor H. E. Pulver.

Research assistants added to the staff of the mining department are D. E. Krause and R. G. Stephenson.

G. C. Ward takes the place left vacant by E. A. Landwehr in the railway engineering department.

H. G. Hyland is a new student assistant in steam and gas engineering.

In the topographic engineering department, F. T. Matthias takes the place of L. J. Beck. H. T. Thrapp is taking over the work formerly done by Mr. Matthias.

BENNETT TAKES CHARGE OF U. W. STATION WHA

Prof. E. Bennett, chairman of the department of electrical engineering, has taken charge of operations for Station WHA, University of Wisconsin, succeeding Prof. E. M. Terry, pioneer research worker in the field of radio, who died this spring.

Prof. Bennett will be assisted in the task of operating the station under the program of expansion which has followed the assignment of a new and more favorable length, by G. Koehler, instructor in electrical engineering. A university radio committee under Prof. H. L. Ewbank, speech department, is handling programs and plans of the station.

For the first time in the history of the station programs were given daily except Sunday during the summer until the end of summer session. Since the station was granted a wave length of 319 meters this spring, assuring a clearer channel and a wider radius than it has ever had, the time that the station is on the air daily has been more than doubled.

A regular university noon hour program which opens at 12 o'clock with a schedule of agricultural talks, is followed by other educational talks, programs of music and entertainment. A home makers program is also broadcast in the forenoon, as are also occasional campus events and festivities.

WESLEY MILLER WINS AIR PRIZE

Wesley Miller, m'31, was awarded a 10 hour flying course as a prize in a national essay contest conducted by the Alexander Aircraft Company and the Weeks Aircraft Company. The prizes offered to winners were an Eaglerock plane, a four year aeronautical course, and 16 free flying courses. Wesley asked that the prize be transferred to a friend as he has had over 2,000 hours of flying to his credit. He served at a pilot with the American Air Force overseas.

ENGINEERING COLLEGE ENROLLMENT SHOWS INCREASE

The enrollment in the College of Engineering shows an increase of about 100 students over last year. The mechanicals stepped out from third and took first place in the number of new students enrolled with 100 freshmen. The former leaders, the electricals, dropped in the number enrolled. to 90. The miners are again last with 9 freshmen.

The enrollment by classes:

	C.E.	M.E.	E.E.	Ch.E.	Min.E.
Freshmen	89	100	90	59	9
2nd Year Freshmen	23	16	16	5	6
Sophomores	63	71	78	40	8
Juniors	68	60	77	22	5
Seniors	40	31	54	21	4
Grads	7	4	7	2	15
Totals	290	282	322	149	47

With the total enrollment in the university at 9438, the per cent of students in the college of Engineering is 10.5.

U. W. FIREMANSHIP COURSE

Firemen from sixty-four Wisconsin cities attended the first course in firemanship held June 25 to 28 under the direction of H. E. Pulver and Chester Allen of the University Extension Division.

The program consisted of lectures on fire-fighting, fire-prevention, and modern fire hazards, and demonstrations of modern fire-fighting equipment.

NEW COURSES OPEN TO ELECTION

A seminar in sanitary engineering has been organized by Dr. M. S. Nichols, of the State Laboratory of Hygiene, to stimulate an interest in the study of recent sewage problems. The meetings are held each Thursday evening in the Memorial Institute at 7:30. Each member is assigned a subject for study, and gives a report at one of the later meeting of the group.

Three new courses have been added in the department of city planning and engineering. These courses are to take the place of the courses in industrial housing and real estate platting.

City Planning 104 is a course in municipal engineering pratcice. It is designed to take up some of the more recent problems of city planning as air port design and park layout.

A course in traffic problems, City Planning 105, which treats with the problems of traffic routing, traffic control systems, and two-decked streets is open to upper classmen in civil engineering.

Highways 105 has been added to the curriculum to supplement the course in elementary highway design and to discuss some of the details of maintenance and design.

KOMMERS ADDRESSES TEST SOCIETY MEET

At the annual convention of the American Society for Testing Materials, held at Atlantic City in June, Professor J. B. Kommers presented a paper on the "Fatigue Properties of Cast Iron". This paper was a part of a symposium on the physical properties of cast iron.

On October 7, Professor Kommers attended two committee meetings of the American Society for Testing Materials and the American Foundrymen's Association at Chicago. These committees are considering the initiation of a program of impact testing of cast iron.

UNIVERSITY PROFESSORS WRITE NEW TEXT BOOK

Professors P. H. Hyland and J. B. Kommers have completed the writing of a book on "Machine Design" which is being published by the McGraw-Hill Book Company. The book will be available for the use of classes shortly after the opening of first semester.

STUDENT SOCIETIES START YEAR'S WORK

The student chapters of the national technical societies are organizing for the year's work. These organizations are fostered by the national technical societies for the purpose of interesting students in the work of these organizations, and to promote fellowship students in a given field of engineering.

The programs of these student organizations consist of talks by faculty members, practicing engineers, and interested parties. During the past few years the student chapters have sponsored the showing of technical movies, furnished by national industrial concerns.

The civils have as their organization a chapter of the American Society of Civil Engineers. Their officers are: Robert J. Poss, president; Alfred W. Wickesberg, secretary-treasurer; Arthur B. Bright, critic; Kenneth Green, publicity; and Franklin T. Matthias, Polygon representative.

George H. Brown is president of the student chapter of the American Institute of Electrical Engineers. Thomas Hagon is vice-president; Arthur N. O'Neil, secretary-treasurer; and Elmer Kwapil and C. R. Dickinson are members of the advisory board.

The chemicals have not as yet organized for the year.

The student chapter of the American Society of Mechanical Engineers has as its president, Martin Mortensen; vice-president, Charles Daniels; Ed Gibson, secretary; Donald J. Miller, treasurer; and Edwin Freyburger, Polygon representative.

The miners are the only ones who are not affiliated with a national organization. They have, however, organized the Miners Club. Theodore Tieman is its president; Phil McCaffery, secretary-treasurer; and C. A. Schmedeman and William Ramsey, Polygon representatives.

Polygon is a central body, organized to correlate the work of the individual societies. Two representatives are chosen from each of the technical societies, one junior and one senior member. The officers are Jack Lacher, president, and Edwin Freyburger, secretary-treasurer.

DO YOU REMEMBER WAY BACK WHEN

Do you remember 'way back when
(say thirty, forty years)
You never saw your sweetheart's legs
But judged her by her ears.
The kids were washed each Saturday night;
Their daddy cut their hair;
Their suits were made from their uncle's pants
And they wore no underwear.
The women padded, but did not paint,
Nor smoke, nor drink, nor vote;
The men wore boots and little stiff hats
And whiskers like a goat.
Not a soul had appendicitis
Nor thought of buying glands.
The butcher gave his liver away
But charged you for his hams.
You never had a bank account,
Your beer gave 6 per cent;
The hired girls got three bucks a week,
And twelve bones paid the rent.
You could stand each night when the work was over
With one foot on the rail
And your hip supported not a thing
Exceptin' your own shirt tail.

PROCRASTINATION

My friends, have you ever heard of the town of Yawn
On the banks of the River Slow,
Where blooms the Wait-a-while flower fair,
And the Some-time-or-other scents the air,
And the soft Go-easys grow?

It lies in the valley of What's-the-use,
In the province of Let-her-slide;
That old "tired feeling" is native there,
It's the home of the listless I Don't-care —
Where the Put-it-offs abide.

The Put-it-offs smile when asked to pay up,
And they say, "We'll do it tomorrow";
And so they delay from day unto day,
Till death sidles up and steals them away,
And the creditors beg, steal, or borrow.

Editorials

OUR EDITORIAL POLICY

A QUESTION has often been raised concerning the exact nature of the editorial policy of the *Wisconsin Engineer*. The interpretation of the purpose of editorials is not one which can be definitely stated. As is the case with the majority of college periodicals, the entire staff varies every three or four years so that a policy established this year may become obsolete and discarded several years from now. Also editorials of similar magazines in different institutions will vary considerably in form and content.

Keeping in mind these facts, it is possible for the present staff to make several generalizations concerning this department of the technical periodical.

Newspapers make a point of definitely establishing their "fors" and "against" which usually consist of civic problems or those pertaining to the immediate locality or state. The newspaper having a daily and large circulation is able to shape public opinion as it wishes by means of its definite editorial policy. The technical periodical however, cannot wisely adopt this principle. Its small monthly circulation has very little influence in comparison to the average newspaper.

Instead, the editorial section is used to express new ideas and thoughts, largely of an untechnical nature, which can be developed in topics ranging from one to five hundred words. It is, in other words, a "hodge podge" of interesting fact, observation, criticism, or prophecy. It is the editor's means of expressing himself, although he may not personally contribute to the column. It should be the section of the periodical which comes in contact with every reader because of its broad, untechnical scope of general interest. It would be much nearer the truth to say that we have no editorial policy, but that we do have a very definite policy of writing editorials.

WE WELCOME YOU

We, of the staff of the Wisconsin Engineer, take this opportunity to welcome the Class of 1933 to the College of Engineering. We hope that your stay here will be both pleasant and profitable, and that you will make the most of your time to prepare you for a life of technical service.

The Wisconsin Engineer was founded on this campus to give the students in the college an opportunity to gain experience in technical journalism, both as to writing and managing. The magazine is published entirely by students and a great percentage of the editorial material is written by students.

There are, at present, a number of openings in the staff. We ask you to help us keep the Wisconsin Engineer on the up-grade. To make the magazine better and better requires the assistance of the student body in general and the staff in particular. May we have the pleasure of introducing you to some of the problems that confront us in the publishing of our magazine, and depend on you to help us out? No unusual ability is required. Anyone who can write clearly and express himself concisely is wanted for our editorial staff. Students who desire to gain experience in the business end of publication and distribution are welcomed to help the business staff.

We think that experience gained in either department is of great value in rounding out a technical education. Again we welcome you to our school and ask that you become interested in The Wisconsin Engineer.

NEW YORK vs. CHICAGO

THE last year has witnessed the development of a great industrial battle which is being waged by our two largest cities. The wealth and power behind these municipalities makes the struggle comparable to an actual war.

Chicago, the younger and more rapidly growing city has been striving to increase its contacts with foreign ports. Thus it is vigorously supporting the Gulf to St. Lawrence Waterway which at the same time may solve its difficult problem of sewage disposal.

New York, already ideally situated with respect to maritime trade, is jealously regarding the trend of population toward the mid-west. It is looking toward the Great Lakes as a source of power at Niagara Falls. The inland lakes will be the foremost battlefield of the contest.

The importance of both cities and their proposed projects to engineering makes this unique situation of interest to the profession of engineering.

WHY ARE YOU HERE?

What good are you deriving from the time you are spending in the Engineering College? This is a question that may be answered in many ways, but most strikingly it may be met by cold mathematical figures.

In the engineering school you are paying for board, room, and tuition; your income is nil. If you held a job, you would be paying for room and board, but would be receiving about a thousand dollars for the average college year. By attending college you are gaining no practical experience, you are learning no special trade, and moreover you are losing about four-thousand dollars.

If you are not developing an ability which will enable you to make up for this loss of money, and the other benefits which the men who are not attending college are enjoying, your time at college is a decided loss.

ENGINEERING REVIEW

(Continued from page 17)

balls, and explosives, unknown to any soul.

"8th. In the days of peace, I should hope to satisfy Your Excellency in architecture, in the erection of public and private buildings, in the construction of canals and aqueducts. I am acquainted with the arts of sculpture and paiting, and can execute orders in marble, metal, clay, or painting with oil, as well as any artist. And I can undertake that equestrian statue cast in bronze, which shall eternaly glorify the blessed memory of Your Lordship's father and of the illustrious house of Sforza.

'And if any of the above seems extravagant or beyond the reach of possibility, I offer myself prepared to make experiment in your park; or in whatsoever place it may please Your Excellency to appoint; to whose gracious attention I most humbly recommend myself."

"Leonardo da Vinci".

Needless to say, Leonardo received the appointment he sought and it was during the years spent in the service of Ludovico Sforza, Duke of Milan, that much of his best work was performed.

GROUND WATER IN THE VICINITY OF LODI, CALIFORNIA

The underground water supply of the Mokelumne River Valley, California, has been under investigation since 1926 by the United States Department of the Interior, through the Geological Survey, in financial cooperation with the East Bay Municipal Utility District. Lodi, the principal town in the area, is noted as the Tokay grape center of the world. The broad vineyards and orchards of this productive agricultural area are practicaly all supplied by water pumped from wells. The Pardee dam, on the Mokelumne River, has just been completed, and the reservoir thus created will supply the cities of Oakland, Berkeley, and Alameda with domestic water. A census made by the Geological Survey shows that there are 2,000 pumps on wells used for irrigation in this valley and that more than 1,000 of the pumps are located in an area of less than 72 square miles. In some parts of the area there is a pumping plant on each 10-acre tract, although on the average 23 acres is irrigated by each pumping plant. A total of 45,800 acres is irrigated by well water. Tests made on the quantity of water pumped show that exclusive of rainfall the average amount of water used annually for vineyards and orchards is 1.3 acre-feet per acre and for alfalfa and garden crops 3.0 acre-feet per acre. On the basis of these tests it is estimated that 64,800 acre-feet of water is withdrawn annually from the ground for irrigation. In addition, about 6,000 acre-feet of water is pumped from wells for domestic use and stock; hence a total of about 70,800 acre-feet is pumped annually. This great quantity of underground water is derived from rainfall on the intake area and from seepage losses in the Mokelumne River after it leaves the mountains. In addition to the wells, 40 pumps along the banks of the Mokelumne River pump the river water for irrigation. In 1928 these pumps diverted about 4,000 acre-feet.

A preliminary report on this investigation, in manuscript form, by Harold T. Stearns, Thomas W. Robinson, and George H. Taylor, is open for inspection by the public in the Lodi Public Library. This report covers about 800 pages and contains many maps, tables, and illustrations. It includes all the data on ground water collected until June 30, 1929, with an interpretation of them, also a description of the geology of the area, numerous well logs, an account of the Mokelumne floods of 1928, all records of stream flow collected in the basin by the Geological Survey, records of about 500 wells, and about 10,000 measurements of the depth of water in the wells.

SURVEY TO BE MADE OF ROAD TRAFFIC IN WEST

Bureau and States Collect Data on Volume and Density of Travel on Main-Traveled Highways

In order that the Federal Government and the Western States may know what the flow of traffic is throughout the year on the main transcontinental highways and on other roads in the Federal-aid highway system in the West, the highway departments of Washington, Oregon, California, Idaho, Nevada, Wyoming, Utah, Arizona, Colorado, New Mexico, and Nebraska and the Bureau of Public Roads of the United State Department of Agriculture will make a traffic survey over a period of one year, beginning this month, announces the Bureau of Public Roads. Among the routes on which traffic will be measured are the historic Oregon Trail, over its entire length from Omaha to Portland, parts of the Santa Fe and Overland Trails, and the long-distance motor-bus routes from Omaha to Denver, Salt Lake City and San Francisco, and from Denver to Los Angeles by way of Santa Fe, and from Seattle to Los Angeles.

The transcontinental highways which give easy access to National parks and monuments and to National forests in the West carry a great and increasing traffic from the East and Middle West, and they pass through public-land States which have large percentages of unappropriated and unreserved public land, relatively low densities of population, and comparatively small revenues for road construction, and in these States Federal-aid has been of material assistance in closing gaps in the through routes.

According to the National Park Service, United States Department of the Interior, automobile travel to the national parks has made tremendous strides in the last six years. In 1923 a total of 191,287 private automobiles entered 12 of the western parks; in 1928 the number was 439,049 cars, 129 per cent more than in 1923; and the 1928 figure for one of the parks was 420 per cent greater than the 1923 figure.

Data compiled by the State highway department of New Mexico in 1927 and 1928 indicate that more than 30 per cent of the vehicles using the roads of that State in those two years were from other States, and on many routes the so-called foreign traffic was more than half the total. The foreign traffic on many of the New Mexico highways was 50 per cent greater in 1928 than in 1927, and the total traffic was 22 per cent higher in 1928 than in 1927. A similar situation is believed to exist in the other Western States.

In these Western States traffic has reached the point where it is necessary for the States to know the flow of traffic density, and composition on their roads, so that they can plan their highway systems on a good economic basis and plan for the removal of snow in winter.

The survey will show the number of vehicles using each of the main

highways throughout the year, by days of the week and hours of the day, and the number of vehicles passing a given point at certain times of the day. It will classify the traffic according to types of vehicles, whether passenger cars, motor trucks, or motor busses, and the number of passengers in passenger cars. The importance of cities, towns, and sections of the State as the source and destination of traffic will be ascertained, and the number of vehicles from other States using the highways, and other information required by State and Federal highway officials, will be obtained. The data will show population trends and will be useful in solving traffic regulation and safety-problems. Surveys will be conducted simultaneously in each of the States.

A NEW ELECTRIC WATER SYSTEM

A new automatic electric water system has recently been placed on the market. This water system was developed by engineers to fill the need for an adequate water supply with constant pressure for country or suburban homes, summer cottages, farms, camps, roadhouses, wayside stands, greenhouses, garages, schools, dairies, circulating ice water systems, and for a booster to increase the city water pressure.

This water system consists of a tank and the pumping equipment. A motor operates the double-acting reciprocating pump. The system is completely automatic, reuiring no attention whatsoever. Three mechanical "guardsmen"—the Automatic Electric Pressure Switch, the Automatic Air Volume Control and Pressure Gauge, and the Automatic Sentinel Circuit Breaker—keep constant watch. The first "guardsman" starts and stops the pumps automatically as the water pressure becomes low or high. The second keeps the right proportion of air and water in the tank, thereby preventing it from becoming water logged. The third protects the motor from any overload or unusual disturbance, which may cause electrical trouble.

Some outstanding points of construction are featured in the automatic water system. For shallow well pumps, a two-bearing crankshaft is used, the bearing being phosphor bronze. The crank shaft is drop forged and is ground to fit. The method of lubrication is universal. Connecting rods and cross heads are bronze, and the piston rods are tobin bronze. The piston liners are bronze and the piston head is brass.

The intake and discharge parts are located high up on the side of the pump. This means the pump is always primed. The unusually large water passage through the pump makes for quiet operation and high efficiency. The valves in the Westinghouse Pump are mounted in a vertical position making them unusually accessible. With this vertical mounting there is considerable less tendency for dirt to accumulate under the valves. The valve seat and pin are one-piece casting. This eliminates the possibility of the pin coming loose or getting out of alignment and interfering with the proper operation of the valve.

A strainer is built in the body of the pump. It is readily accessible and by the removal of a brass strainer plug, the pump can be drained in freezing weather or thoroughly cleaned when necessary.

The built-in relief valve is most practical. It is metal to metal and operates as a by-pass from the discharge side of the pump to the suction side. When pressure becomes too great the relief valve opens and the water recirculates through the pump.

The intake and discharge connections are so arranged that they need never be disturbed when the pump is taken completely apart and assembled again.

The motor armatures are individually balanced by a patented dynamic balancing machine, thus assuring smooth rotation and quiet operation. Exceptionally high efficiency and power factor cause economy of operation of the motor.

These water systems are available in tank sizes of 42, 80, and 120 gallons with a capacity of 300 gallons per hour and with an operating range of 20 to 40 lbs. pressure.

COAL AND OIL IN HANNA AND CARBON BASINS, WYOMING

There is 4½ billion tons of minable coal in the Hanna and Carbon Basins, in Carbon County, south-central Wyoming, according to the Geological Survey, Department of the Interior, which has published, as Bulletin No. 804, a report by C. E. Dobin, C. F. Bowen, and H. W. Hoots, describing the geology and the coal and oil resources of these basins. Extensive coal-mining operations have long been in progress in these great basin-shaped depressions, and as their coal-bearing areas are traversed by the main line of the Union Pacific Railroad the unmined reserves of coal are readily available at such future times as they may be in greater demand. Most of the mined coal comes from the mines of the Union Pacific Coal Company at Hanna, and about 90 per cent of it is used by the Union Pacific Railroad.

Although the rock strata have been bent into folds, practically all the anticlines that might serve as reservoirs for oil have been tested, and in only one, the Saddleback Hills anticline, has oil been found in commercial quantities.

ALASKA AERIAL SURVEY DISCOVERS POWER SITE

Airplane and Camera Promise to Play Great Part in Economic Progress of Territory

A power site of more than 20,000 horsepower has been discovered in the Tongass National Forest, southeastern Alaska, by the Alaska Aerial Survey Expedition now working in that region, according to information telegraphed to the Forest Service, United States Department of Agriculture in Washington. The aerial survey is expected to prove extremely valuable in connection with power development for the manufacture of wood pulp on the Tongass forest. The power site, just discovered, is on the east side of Taku Inlet near Greely Point.

Lakes, streams, and other important topographic features of the Tongass forest, the existence of which hitherto has not been known, have been revealed by the survey of the forest from the air.

Before the aerial survey expedition began its work none of the greater part of the land surface of southeastern Alaska had ever been surveyed. The shore lines of the islands and the mainland had been delineated, but farther inland the maps were largely blank, even within one mile of tidewater. In 1926 a total of 10,000 square miles was mapped. The work is now being continued this summer. It is anticipated that an equal area will be covered in 1929, and this will complete the work to be done in this region.

RESONANT CONTROL FOR STREET LIGHTS

The rapid development of radio has greatly stimulated interest in the properties of electric circuits. It has led to a clearer, better and much more general understanding of all circuit phenomena and particularly those relating to high frequencies. This knowledge and experience has lately been turned to great practical advantage in providing a solution for the problem of street light control.

The difficulty of turning multiple street lights on and off has been a serious obstacle to the general adoption of the multiple system. This problem has been solved by the use of medium frequency currents. These currents are superimposed on the regular power currents and in no way affect or interfere with the normal operation of the power system.

The general idea of superimposing medium frequency currents on the circuits of a power system was proposed many years ago. It remained unsolved however until the advances in radio gave a clearer understanding of the circuit properties involved. The work was finally undertaken and completed by the Radio Engineering Department of the Westinghouse Electric & Manufacturing Company at the request of one of the large power companies directly interested in supplying multiple street lights from its existing secondary network. The apparatus developed represents the results of four years of intensive research and experiment in conjunction with one of the largest public utilities in the country. The system as worked out

is quite simple. The control units are small in size, rugged in design, and of low cost. The system is believed to be superior to any known existing method for the control of multiple street lights. It is also well adapted to the remote control of series lighting systems fed by pole type regulators. Many difficult problems of remote control and switching may be solved by adopting this system.

General Principle

The basic idea of the control system is to use the existing power conductors as the control circuit. The control currents are transmitted over the lines just like power currents. The frequency of the control currents used is sufficiently higher than the power frequency to make it easy to separate the control currents from the power currents.

Special relays employing tuned circuits are provided at points where control is desired. These relays are connected across the 110-volt mains which feed the individual street light or group of lights. The relays respond only to currents having the particular frequency for which they are tuned. Sufficient energy is fed through the power system to the control relays to operate them by the direct electromagnetic pull of the control currents themselves without the use of vacuum tubes, amplifiers or rectifiers of any kind. This avoids complication and delicacy in the control units and also avoids using parts requiring periodic replacement.

Two control frequencies are used, one to turn the lights on and one to turn them off. This method is preferred because of its directness and simplicity. Where only two or three simple operations are required the use of one frequency for each operation works out better than by using a single frequency with some form of selector. It gives a system of greater simplicity and reliability. It is also more compact and much cheaper.

The control currents are fed into the power system at the substation. A single feeder may be energized alone or all the feeders on a bus may be energized at the same time. Single phases may be energized by switching from feeder to feeder, or the entire bus may be energized by making connection to the bus instead of to individual feeders. The control currents flow along the conductors just as though the power currents were not present. The frequency of the control currents is selected so as to avoid serious loss in transmission and to permit being efficiently stepped up or down through the existing power transformers. Frequencies of about 500 cycles are used. These frequencies are transmitted with very little loss even through cable systems.

MANY NEW FEATURES USED ON BIG AIRLINER

The Burnelli monoplane, "Airliner," recently constructed, is one of the latest evidences of the rapid strides being made in the development of modern aircraft.

The fuselage of the plane, which is especially designed to reduce landing speed, is 36 feet long and 12 feet wide and has a lift of four pounds per square foot. The wings, which are of the traverse stringer type, have a square foot lift of about 14½ pounds. In order to minimize the wind resistance, the ship is fitted with a retractable landing gear

that can be operated by a lever from the cockpit. The wheels may be retracted in seventeen seconds and extended again for landing in eight seconds. When the wheels are retracted, a red electric light serves as a warning to the pilot.

Power is obtained from two motors of 700 h. p. each, which are mounted on a triangular frame so that they may be swung out from their original position, making repairs less difficult. Two 280-gallon tanks in the wings and one 440-gallon tank in the cabin furnish the fuel for the mammoth engines. The "Airliner" has a cruising speed of 115 miles per hour and a maximum speed of 145 miles per hour.

In designing the interior of the cabin, every effort was made to furnish it in the most luxurious manner possible. The chairs are heavily upholstered and may be made to assume any position from upright to recumbent. There are electric lights throughout, several base plugs even being provided for reading lights. As a final refinement, the cabin is made sound-proof with balsam wool and the engines muffled so that the plane rides as quietly as an automobile. —*Tech. Eng. News.*

THE UTILITY OF OILLESS BEARINGS FOR INDUSTRY

When lubrication fails, the whole structure of industry crumbles. Proper lubrication of machinery presents one of the greatest opportunities for economies in manufacturing costs in present-day equipment. These economies may result from such sources as the amount of lubricant purchased, higher speeds through more perfect running conditions, savings in repair bills due to breakages, or decreased machine investment.

One type of oilless bearing now on the market that has been developed sufficiently to be of high efficiency is the one using rubber. In the true sense, rubber makes the only oilless bearing, as oil destroys its life very rapidly. The lubricant used in this case is just ordinary water. The wetter the bearing is kept, the longer it will last. No installation should be attempted where a steady stream of water cannot be supplied to the bearing at all times. One class of work that affords an ideal location for this bearing is the marine engine, such as in the outboard supports for the propeller shafts. This shaft is always submerged, and is therefore particularly inaccessible for ordinary oiling operations. The water is flushed through the bearing by means of slots or grooves in the rubber.

In industrial machinery, a modified water system is arranged for. Spiral grooves run the length of the bearing and serve to place the water on all parts of the shaft contact. These grooves are made larger than would be grooves for an oil bearing of the same size, but they serve the exact purpose.

In centrifugal pumps of the overhung type, the bearing next to the impeller has always been hard to lubricate properly. The rubber bearing solves this problem. Even in the old-type oil bearings, the water always reached this bearing and caused excessive scoring due to the grit that was washed in with it. With the rubber bearing, all sand and grit is either washed out with the water or sunk harmlessly into the rubber, avoiding the great cost of a complete replacement.

Bearings of this type will come into wide use in high-speed turbines as high-speeds do not affect them as long as the supply of water is adequate; in fact, it is not advisable to run shafts lower than 100 ft. p. m. At relatively high speeds loads up to 1000 lbs. per sq. in. may be carried with the utmost safety.

While rubber is not a cure-all for all bearing ills, its limitations can be easly overcome. They are: It must never be run dry, even at starting; the shaft must be smooth; oil and grease must be kept from it at all times; slow speeds are detrimental especially if the loads are heavy. —*Power Transmission, April, 1929.*

WHAT THE CLASS OF '29 IS DOING

(Continued from page 9)

Ludwigsen, Lester, has enrolled in the General Electric Company's radio test course. During the summer Ludwigsen was married to Miss Evelyn Miller of Bayfield, Wisconsin. The couple are now at home at 108 State street, Schnectady, New York.

Mangus, Louis B., is at present in the Long Line Department's training course of the American Telephone and Telegraph Company of Chicago. He may be reached at 1517 Howe street, Racine, Wisconsin, as he is not permanently located as yet.

Maxfield, Frederick A., who was married on June 24 to Mary S. DeWeese, L & S'29, and honeymooned in Montreal, Canada, is now with the Westinghouse Electric and Manufacturing Company as research engineer. The young couple are at home at 313 South avenue, Wilkinsburg, Pennsylvania.

Odbert, Eugene, has been employed as resident manager by the developers of Chambers Island, an exclusive summer resort near Green Bay, Wisconsin. Odbert's work consisted of subdividing the property into lots, building a golf course, roads, and an airport. Mail addressed to Sturgeon Bay will reach him.

Oldenburg, Carl R., is at present in the employee of the Illinois Bell Telephone Company of Chicago. Carl was maried on June 25 to Norma E. Hornberg of Madison and the couple spent their honeymoon touring northern Wisconsin and Canada. Mr. and Mrs. Oldenburg are now at home at 325 N. Austin Boulevard, Chicago, Illinois.

O'Roser, Clarence, is at present working on new maintenance methods for the Wisconsin Telephone Company at Milwaukee. His permanent address is 136 — 18th street, Milwaukee, Wisconsin.

Phelps, H. S., has located with the Allen-Bradley Company of Milwaukee, Wisconsin. His present position is in the research department. Mail addressed to 136 — 18th street, Milwaukee, Wisconsin, will reach Phelps.

Ricker, William J., who attended Stout Institute during the summer, is, according to latest information, at home at 215 Memorial Drive, Appleton, Wisconsin.

Schugt, Arthur J., is at present a student in the training course of the Chicago Central Station Institute at 72 West Adams street, Chicago, Illinois.

Somerville, Harry V., has been employed as a student engineer by the Radio Corporation of America with offices at 233 Broadway, New York City, New York.

MAKING BORE HOLES

Lesson No. 4 *of* Blasters' Handbook

A BORE HOLE may be anything from a shallow hand-drill hole in a boulder to a deep, well-drill hole or a tunnel 100 or more feet long. And in all the great variety of bore holes between those extremes lies a startling complexity of methods, conditions, precautions and implements.

What a soil punch, a coal auger, a hand drill, a churn drill, a hammer drill, well drills, tripod drills, and post drills look like and do are illustrated and simply described in Chapter Four of the *Blasters' Handbook*. Tells, also, about tunnels, springing bore holes, the care of drill bits, pumps and spoons for bore holes, and other practical field pointers about making bore holes.

The *Blasters' Handbook*, prepared originally for the use of du Pont field service men, is an extremely practical reference and study work. Leading technical institutions are using the *Blasters' Handbook* in their classrooms. Pocket size for your convenience.

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Name.....

Course of Study:.....**Class of:**.....

City.....**State**.....

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Stroinski, Bruno C., is located at the South Milwaukee plant of the Bucyrus Erie Company. He is at present checker and layout man. His residence address is 632 Edgerton Avenue, Cudahy, Wisconsin.

Stokes, Leslie H., has been enrolled as a student in the engineer's training course of the Illinois Bell Telephone Company at Chicago. At present he is living at 716 Clark Street, Evanston, Illinois.

Suehs, Andrew M., has secured a position as Junior Engineer with the T. M. E. R. & L. Company of Milwaukee. His work consists of general construction work about the plant including installation of circuit breakers, disconnect switches, cable and bus wire, and the changing of feeders for special conditions. Suehs' present address is 184—15th Street, Milwaukee, Wisconsin.

Sweet, Alva L., is now with the General Electric Company at Fort Wayne, Indiana. Alva's first assignment in the test course was in the transformer department with K. McDougal, C. A. Thompson, and Royce Robarge, all of the class of '28. Sweet's present address is 914 W. Jefferson Street, Fort Wayne.

Turpin, Allan F., after spending thirty days in C. M. T. C. camp at Camp Custer, Michigan, is now employed by the Balkite Radio Company as Assistant Radio Engineer. Turpin can be reached at the Y. M. C. A., Waukegan, Illinois.

Wegner, Ernest A., former business manager of the Wisconsin Engineer, is not a student any more, in fact, he is a lawyer. "Ernie" is at present with the law firm of Chindahl, Darker, and Coulson, and is attending night law school at the Kent Law School in Chicago. His mail address is 207 S. Kenilworth, Oak Park, Illinois.

Zastrow, Irvin E., has been employed by the Wisconsin Power and Light Company in their Transportation Department. His present address is 37 Church Street, Oshkosh, Wisconsin.

MINERS

Schoen, John E., has accepted a position as Professor of Mechanical and Metallurgical Engineering at Marquette University in Milwaukee. His residence address is 1191—38th Street, Milwaukee, Wisconsin.

Williams, John J., has been employed in the Metallurgical division of the Youngstown Sheet and Tube Company of Indiana Harbor, Indiana. Mail addressed to him at 7601 Saginaw Avenue, Chicago, Illinois, will be forwarded to him.

Stephenson, Ronald G., has returned to the University and is working for his M. S. in Mining and Metallurgy.

Krause, Daniel E., who worked all summer as Laboratory Research assistant for the Sivyer Steel Casting Company of Milwaukee is now back in school taking his M. S.

Smith, Harrison A., has been employed as an engineer with the Wisconsin Power and Light Company of Madison. During the summer Smith was married to Miss Carolyn K. Lomnsbery of Benton Harbor, Michigan. The couple are living at 227 Clifford Court, Madison, Wisconsin.

MECHANICALS

Brown, Robert V., after a month's work in the Beaver Dam shops and long camping trip, has returned to the University with a fellowship and will work for his M. S. during the coming semesters.

Case, Clinton D., who spent the summer preparing a correspondence course in Aeronautics for the University of Wisconsin Extension Division, is now an assistant professor of Mechanical Engineering at the University of Oklahoma, Norman, Oklahoma.

Conry, Clifford E., is taking the student engineering course of the American Blower Corporation at Detroit. His address is 700 Bethune, Detroit, Michigan.

Derleth, Clark F., has been employed as a gear specialist with the Nash Motors Company at Milwaukee, Wisconsin. His residence address is 654 Herman Street, Milwaukee, Wis.

Dodge, L. A., is now a cadet engineer with the Bailey Meter Company. Most of his work is along experimental lines. Mail addressed to 17019 Hillsboro Road, Cleveland, Ohio, will reach him.

Eggert, Edwin H., is now employed in the engineering division of the Proctor and Gamble Company at Ivorydale, Ohio. His residence address is 728 Burr Oak Street, Cincinnati, Ohio.

Felten, Howard A., is now chief draftsman for the Milwaukee Forge and Machine Company of Milwaukee. His residence address is 707 Superior Street, Milwaukee, Wis.

Geittman, F. J., has been employed by the Fairbanks-Morse Company of Beloit. His present work is in the testing laboratory of the Diesel Engines. Geittman is living at 823 Church Street, Beloit, Wisconsin.

Hyland, Harvey G., is now with the Technical Staff of the Ruessler and Hasslocker Chemical Company of Niagara Falls. On the day of his graduation Hyland was married to Lorraine Hodgson, Home Ec'28. The couple's address is now 2726 La Salle Avenue, Niagara Falls, New York.

Klatt, Welsey, has located with the Waukesha Motor Company as a designer in the engineering department. His address is 606 Center Street, Waukesha, Wisconsin.

Kratsch, A. E., has located in the experimental laboratory of the heating division of the Modine Manufacturing Company of Racine. His address is 2117 Slausen Avenue, Racine, Wisconsin.

McGourty, Francis J., has accepted a position as special apprentice in the locomotive department of the Chicago, Milwaukee, St. Paul and Pacific Railway at Miles City, Montana. McGourty has been running evaporation tests on oil burning converted Mallet type locomotives. Mail addressed to 55 — 35th Street, Milwaukee, Wisconsin, will be forwarded to him.

McLane, John D., who is taking care of "Ernie" Wegner and protecting him from the wicked things in the city of Chicago, has enrolled in the rotational training course of the Illinois Bell Telephone Company of Chicago. His address is 207 South Kenilworth Avenue, Oak Park, Illinois.

Phillips, Gustave, has been employed as experimental engineer by the Lubrication Devices Incorporated, manufacturers of centralized lubrication systems for automotive and industrial purposes. Phillips' present address is 51 South Washington Street, Battle Creek, Michigan.

Rex, Harland E., has been employed by the Carrier Engineering Corporation of Newark, New Jersey. Since Rex has been on the job he has balanced and tested a weather manufacturing machine in one of the new theaters at Atlantic City, installed an air conditioning plant in a fourteen story Philadelphia department store, and last but not least, has announced his engagement to Kathryn Murphy of Madison. Rex's last registered address was 3928 Locust Street, Philadelphia, Pennsylvania.

Rusch, Edward, is now in the student training course of the Frigidaire Corporation. His address is 1827 North Main Street, Dayton, Ohio.

Rutherford, Marvin H., has located with the Chicago Transformer Corporation as assistant to the Chief Engineer. Rutherford's position includes some laboratory work, considerable production planning, and supervision of the drafting department. Mr. Rutherford may be reached in care of the above company at 2626 West Washington Boulevard, Chicago, Illinois.

Schueler, Lyle B., has become a cadet engineer with the Fuller Lehigh Company of Fullerton, Pennsylvania. His residence address is 47 N. Jefferson Street, Allentown, Pa.

THE COLORADO RIVER, THE IMPERIAL VALLEY AND THE BOULDER CANYON PROJECT

(Continued from page 7)

diversion of water from streams regardless of the riparian lands and its uses at points needed either within or without the particular drainage area from which it was derived, and for any useful purpose. A water right established by priority of appropriation, confirmed by reasonably diligent development, and maintained by continued application to a useful purpose. This principle established by custom has been confirmed by many of the states and by federal enactment. This principle holds on any drainage area where it has been adopted, regardless of state lines.

In the Colorado River Valley the water rights of the Imperial Irrigation District were established in 1899, and apparently prior to the rights of most of the 1,700,000 acres now under irrigation in the upper basin. It is apparent that the use of the water in the upper basin was in part the cause of the depletion of the supply at the intake of the Imperial canal in 1924, and that the Imperial Irrigation District has the legal right to restrain these districts from taking water from the stream under such conditions. If this right can be and is enforced, it will cause great losses and distress in the irrigated areas of the upper basin.

As there is ample water each year flowing in the Colorado River for all present uses, and as most of it flows unused to the gulf during the flood period, it is obvious that the difficulties arising through deficient flow in the dry period of years of low flow can be overcome by the storage of the excess flow during floods by reservoirs in the deep canyon section of the stream where high dams can be constructed and reservoirs formed sufficient to store almost any desired quantity of water.

The necessity for this storage for the purpose mentioned above is one of the principal reasons for the favor with which the Boulder Canyon Project is regarded in the states of the upper basin.

The storage of water for the purpose of equalizing the flow of the river and increasing the supply available during the normal low water period has the additional advantage of reducing the floods from the upper river that are so dangerous and are the cause of such great expense to the districts in the delta country and to other districts and cities in the lower basin.

The impounding of these waters in a great reservoir will also result in desilting the river water and, while the clear waters from the reservoir, which is 300 miles above the delta country, will undoubtedly take up from the silt deposits in its bed below the proposed dam quite as much silt as it now carries, the quantity of such silt is limited, and ultimately the bed will be lowered, paved by the heavier gravels and pebbles which exist in the bars and shallows of the stream, and the flow of the river will ultimately reach the intakes of the irrigation districts below free from the silt which is now causing so much trouble and expense.

In this connection [illegible] that the removal of silt from [illegible] District and its removal or treat [illegible] farmers is estimated to cause [illegible] re than $1,300,000, and that v [illegible] content of the waters is remove[illegible] ne Laguna Dam from the waters [illegible] Reclamation District, still the rema[illegible] auses an annual expense of perhaps $150,000.

On the other hand, the retention of this silt in the proposed reservoir will result in the ultimate failure of its purpose. Unless other reservoirs are built above it, or some possible method found to reduce the silt content of the waters, it is believed that the reservoir will be filled and useless for its purpose in less than two hundred years.

It is also a matter of interest and importance that the Colorado River with its fall of 7500 feet from the headwaters in Colorado to the Gulf of California and its deep canyon section, has about the greatest potential power possibilities of any of the rivers of the United States. Already numerous small hydro-electric plants have been developed on its upper tributaries where power markets exist but its main canyon section remains untouched. It has been estimated by the engineers of the Reclamation Bureau that under present conditions 6,000,000 continuous horse power might be developed on this river but that if precedent is given to irrigation in the available lands of the basin, as the ultimate importance of irrigation seems to demand, there will still be available about 3,000,000 continuous horse power, although the ultimate total amount will depend upon the methods of development and the evaporation losses from reservoirs both for irrigation and for power purposes.

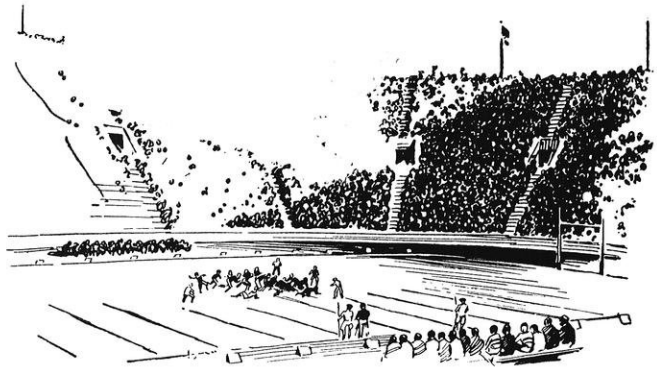
Previous to the enactment of legislation authorizing the Boulder Canyon Project, various power companies had filed on most of the important power sites on the river. Congress, however, has withdrawn these sites from entry until such time as the irrigation and other public interests can be properly protected. It is quite evident that if the power rights in the canyon section should now be granted, further irrigation in the upper basin would forever be prevented, for while irrigation rights are superior and can condemn water rights used for power or mining purposes, such rights can be exercised only by the payment of damages for all developments affected. Irrigation enterprises are at the present time usually difficult to develop on a profitable basis, and the payment of damages on extensive power developments would undoubtedly prove a handicap too great to overcome.

In 1922 an attempt was made by the several states of the Colorado valley to adjust their interests by a mutual agreement authorized and later confirmed by Congress.

A compact was signed at Santa Fe, New Mexico, November 24, 1922, but was confirmed by only five of the seven states. This compact was a preliminary agreement of the seven states of the Colorado River basin which attempted:

1st. To provide an equitable division or apportionment of the use of the water of the Colorado River System.

C[illegible] T[illegible] A BIG GAME



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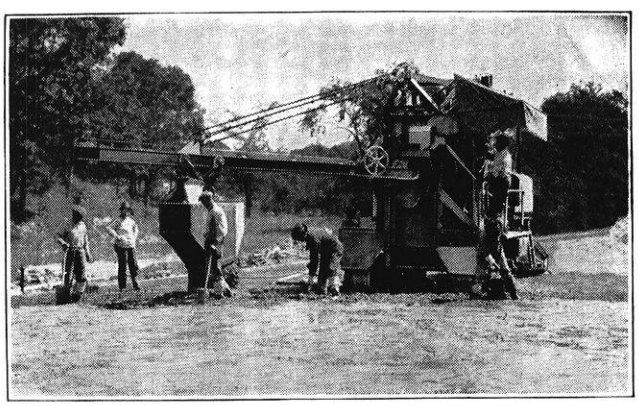
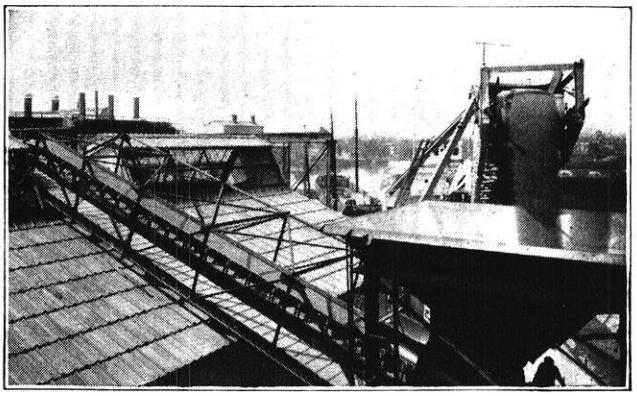
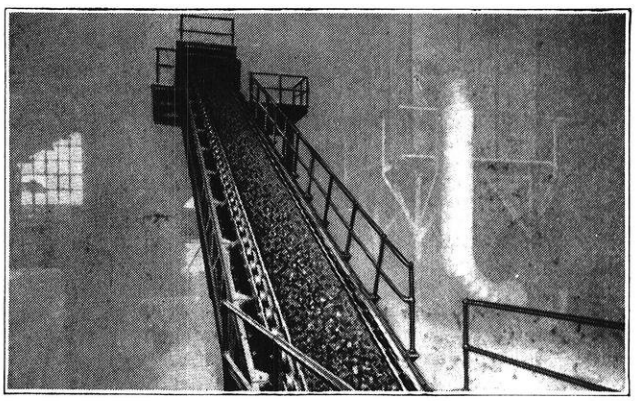


One of the Rex Pavers Building America's Roads



Rex-Stearns Belt Conveyor in a Cement Mill



Rex Pan Conveyor Handling Cement Clinkers

and the finished cement are moved by Mechanical Handling Equipment.

Rex Equipment, designed and built by the Chain Belt Company, handles much of the cement manufactured in this country. In quarries and cement mills, Rex Conveyors and Elevators carry the rock from quarry to car, from car to mill, and to and from the various huge machines that convert it into cement. And Rex Mixers and Pavers prepare it for its final use in building or road construction.

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2nd. To establish the relative importance of different beneficial uses of water from the river.

The compact untertakes:

1st. To subdivide the drainage area of the river at Lee's Ferry into the upper and lower basins.

2nd. To apportion 7.5 million acre feet per annum to the upper basin and 8.5 million acre feet to the lower basin.[1]

3rd. To provide that such water as may have to be furnished to Mexico shall come (a) from the surplus flow of the stream and if this be insufficient for the purpose (b) from the flows apportioned to the two basins in equal proportion.

4th. To provide that any use of the river for power purposes shall be subservient to the use and consumption of such water for agricultural and domestic purposes.

This compact apportions no water to the individual states and the legislature of the State of Arizona refused to confirm the compact for the reason, in part at least, that the state of California was in position to utilize most of the water apportioned to the southern basin, thus leaving Arizona without adequate opportunity for ultimate additional agricultural development.

The state of California signed this compact with the provision that a great reservoir should first be developed in the canyon section sufficient to store the waters necessary for the use of the lower basin as otherwise the primary water rights previously acquired by California territory might be abrogated.

The state of Utah first approved the compact but afterward withdrew its approval.

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[1]One million acre feet of the amount apportioned to the lower basin probably represents the flow of the Gila River which lies almost entirely in Arizona. The flow of the Colorado at Lee's Ferry is apparently to be divided equally between the upper and lower basins.

EDITOR'S NOTE—This is the first installment of the article. It will be concluded in the November 1929 number of this magazine.

Prof. D. W. Mead, the author of this article, is an authority on the Boulder Dam Project. He served on the Boulder Dam Commission appointed by the National Government to investigate the project. Prof. Mead, in addition to his work as a consulting engineer, is Professor of Hydrology at the University of Wisconsin.

WHAT EVERY SECRETARY KNOWS

The Sales Manager was examining candidates for the position of private secretary. One girl seemed to fill the bill, but the cautious official decided to ask her one more question.

"You say you are a confidential secretary. What is the difference between a confidential secretary and a stenographer?"

"Oh," said the girl promptly, "you don't dare to fire a confidential secretary."