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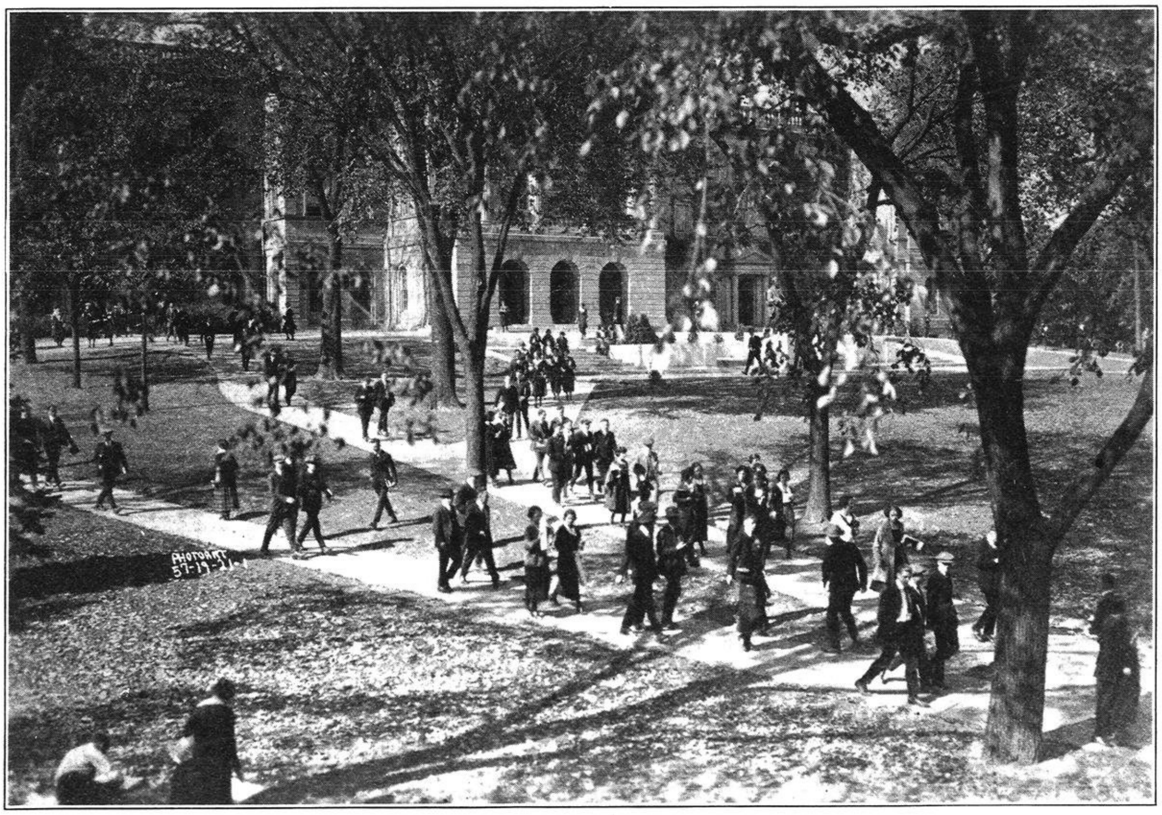

TWELVE O'CLOCK

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The Wisconsin Engineer

UNIVERSITY OF WISCONSIN

VOL. XXV, No. 2. MADISON, WIS. NOVEMBER, 1920

TEN-YEAR TESTS SHOWING THE EFFECT OF AGE AND CURING CONDITIONS ON THE STRENGTH OF CONCRETE

By M. O. Withey

Professor of Mechanics

In the summer of 1910 a series of experiments was started in the Materials Testing Laboratory to secure some information about the effect of age and curing conditions on the compressive strength of concrete. Although this series of tests cannot be considered to be very comprehensive in the light of research programs on concrete which are now in progress, yet it is believed that dearth of information on the subject warrants the following account of the results obtained at the ten-year period. A complete statement of the scope of the tests and results obtained up to the four-year period was published in the issue of this magazine for February, 1915, and additional results of tests at the seven-year period appeared in the issue of February, 1918. For the benefit of those who do not have the earlier reports the program is briefly outlined.

Program

The completed series of experiments will comprise crushing tests on 450, 6 x 18 in. concrete cylinders besides a considerable number of tests of neat cement and mortar test pieces. In the original program, tests covering ages up to ten years were planned, but after the series had been started it seemed best to spread the tests over a much longer period. It is now hoped that arrangements may be made to distribute the remaining tests so that the entire program will cover a 50-year period. Half of the concrete specimens were of 1:2:4 proportions by volume; the remainder of 1:3:6.

Three curing conditions are in use:

1. Storage in a water tank at a temperature of 60 degrees to 70 degrees F;

TABLE I.

The Effect of Age on the Compressive Strength of Concrete Subjected to Different Curing Conditions

Materials: Atlas cement, Janesville sand, and Madison limestone (1¼ in. to ¼ in. in diameter).
Mixing: All materials were mixed in a No. 0 Smith mixer ¾ min. dry and 2¼ min. wet.
Specimens: The cylinders were 6" in diam. and 18" high. Fifteen specimens were made from each batch of concrete and were numbered consecutively.
Curing: All specimens were cured in molds for 3 days and sprinkled for 11 days. They were cured as indicated. The storage water for the water-cured specimens was renewed about once every month; its temperature varied from 60°F. to 70°F.

MIX :- 1:3:6 Water :- 10% of dry weight of materials

Specimen No.	Age: Years	Age: Months	Specific Weight When Tested lb/ft.³	Percent Weight Lost in Curing	Maximum Load lb.	Ultimate Strength lb/in²	Average Percent Error of Mean	Average Ultimate Strength lb/in²	Ave. Weather Conditions for Last Week in Cage: Percent Humidity	Temperature Degrees F.	Percent Cloudiness	Total Precipitation - in.
SPECIMENS CURED IN CELLAR												
234	10	0	141.6	3.02	54200	1925						
279	10	0	150.4	3.42	53150	1900						
324	10	0	148.6	3.86	62500	2205						
369	10	0	145.5	3.86	57260	1980						
414	10	0	143.3	1.62	51200	1810	5.23	1964				
SPECIMENS CURED IN CAGE												
229	10	0	148.0	1.25	72300	2590			64	69.6	40	
274	10	0	145.4	2.73	99870	3525			64	69.6	40	
319	10	0	144.0	1.62	75900	2680			64	69.6	40	Trace
364	10	0	146.0	2.26	78200	2765			64	69.6	40	
409	10	0	144.5	1.85	77980	2780	9.16	2868	64	69.6	40	
SPECIMENS CURED IN WATER												
239	10	0	149.5	-2.10	67400	2410						
284	10	0	149.7	0.23	79900	2840						
329	10	0	146.7	-2.13	62500	2225						
374	10	0	149.2	-1.13	73850	2580						
419	10	0	149.1	-1.62	63850	2265	7.98	2464				

MIX :- 1:2:4 Water :- 10% of dry weight of materials

Specimen No.	Age: Years	Age: Months	Specific Weight When Tested lb/ft.³	Percent Weight Lost in Curing	Maximum Load lb.	Ultimate Strength lb/in²	Average Percent Error of Mean	Average Ultimate Strength lb/in²	Ave. Weather Conditions for Last Week in Cage: Percent Humidity	Temperature Degrees F.	Percent Cloudiness	Total Precipitation - in.
SPECIMENS CURED IN CELLAR												
9	10	0	143.2	2.45	83000	2835						
54	10	0	144.8	2.73	88000	3105						
99	10	0	144.4	2.28	85500	3015						
144	10	0	143.1	2.06	80500	2820						
189	10	0	147.6	2.29	82300	2910	3.35	2937				
SPECIMENS CURED IN CAGE												
4	10	0	144.4	0.92	119500	4170			64	69.6	40	
49	10	0	147.0	0.68	117300	4070			64	69.6	40	
94	10	0	147.8	0.90	119300	4180			64	69.6	40	Trace
139	10	0	144.7	2.05	97500	3440			64	69.6	40	
184	10	0	146.6	1.80	96900	3420	8.84	3856	64	69.6	40	
SPECIMENS CURED IN WATER												
14	10	0	150.0	-0.89	101000	3515						
59	10	0	149.5	0.67	137000	4800						
104	10	0	151.7	-1.60	103300	3685						
149	10	0	147.5	-1.85	133500	4750						
194	10	0	149.0	-1.15	109900	3870	12.63	4124				

NOTE: The Per cent Weight Lost in Curing for Specimen 274 should read — 0.68.

2. Storage in a cage out of doors where the concrete cylinders rest with ends on the ground and are exposed to all conditions of weather;
3. Storage in a cellar which has a range in humidity from 50 to 75 per cent and a temperature range from 35 degrees to 70 degrees F.

Making and Testing of Specimens

Much care was exercised in making the specimens to secure uniformity in all operations so that the variation between test pieces would be as small as possible. Atlas Portland Cement, Janesville sand, and Madison crushed limestone were used in making the concrete specimens.

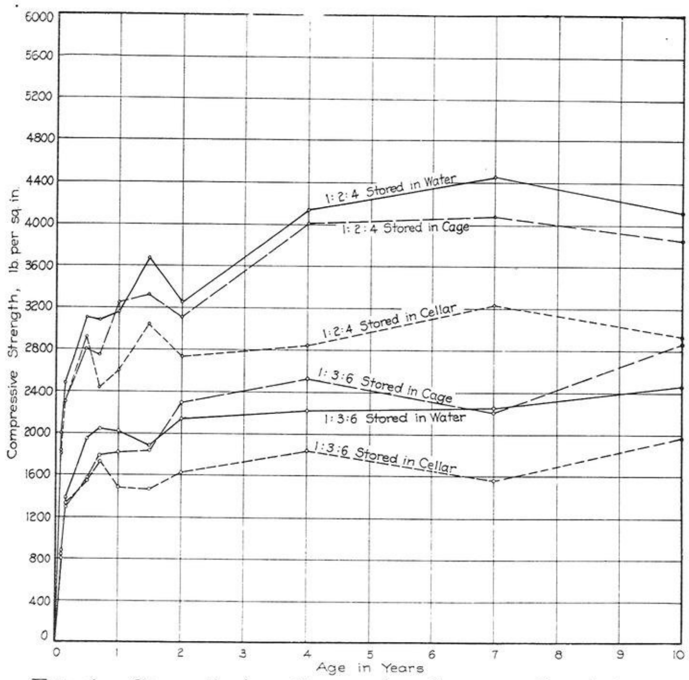


FIG. 1.—*Strength-Age Curves for Concrete Cured in Various Manners.*

They were mixed in batches of 15 in a No. O Smith mixer for a period of three minutes. About ten per cent of water, by weight of dry materials, was required to obtain a concrete of proper consistency. When tempered with this amount of water, the mix flowed sluggishly from the shovel and was easily puddled with a rod during molding. Concrete specimens were cured three days in molds; marked, measured, and weighed on the fourth day; then sprinkled twice a day until two weeks old, when they were subjected to the various storage conditions. The cement and mortar test pieces reported herein were fabricated and cured in accordance with standard practice.

Five concrete specimens from every batch were subjected to each storage condition. The schedule of tests was so arranged that only one specimen of a given batch and curing condition was tested at a time. Five concrete and three or four mortar test pieces were broken at each test period.

Concrete specimens were stored in the laboratory one week prior to testing; mortar specimens were tested immediately on removal from the water bath.

A spherical bearing was used in making all compression tests. The speed of the pulling head of the machine was between 0.05 and 0.10 in. per minute. Briquettes were tested in a Riehlé Automatic Shot Briquette Tester.

Data

Figure 1 shows strength-age curves for concrete subjected to the three curing conditions. Table 1 contains the results of concrete tests made at the ten-year period.

Some interesting data on the effect of long storage on the properties of Portland cement are given in Table 2. Figure 2 shows strength-age curves for the same data. Unfortunately the neat cement and mortar test pieces made of the fresh cement were not made by the operator who fabricated the remainder of the specimens. In as much as the latter operator was somewhat more experienced than the former, the early strengths of test pieces

TABLE 2.

RESULTS OF TESTS ON ATLAS PORTLAND CEMENT AFTER DIFFERENT PERIODS OF STORAGE IN A CLOSED TEN-GALLON TIN CAN.

Tests were made in accordance with the Standard Specifications of the A. S. T. M. Each tensile result is the average for three or four briquettes, each compressive result for three two-inch cubes.

Chemical Analysis of fresh cement:—$CaO = 61.28$; $SiO_2 = 21.59$; $MgO = 2.52$; $Al_2O_3 + Fe_2O_3 = 9.70$; $SO_3 = 2.09$; Loss on ignition = 2.47; Total = 99.65 percent.

Physical Properties.

Age of Cement when Gaged with Water.	Results of Steam Tests on Pats.	Residue on No. 200 Mesh sieve. Per-cent.	Time of Set Initial Hr. Min.	Time of Set Final Hr. Min.	Per cent Water for Neat	Per cent Water for 1:3 Mortar
Fresh	O. K.	22.5	1 — 54	5 — C5	21.0	9.5
7 years	O. K.				21.0	10.0
10 years	O. K.	23.6† 25.6*	3 — 30	6 —30	21.0	10.0

*Without drying. †Dried.

Strength Tests.

Age of Cement when Gaged with Water.	Age after Gaging with Water. Yr. Mo. Da.	Strength of Mortars in lb./in.² Tensile Neat	Tensile 1:3	Compressive Neat	Compressive 1:3
Fresh	1 — 0	671	279	6500	1855
	2 — 0	723	312	8800	2075
	6 — 0	740	348	9130	2579
	9 — 0	711	314	8875	2850
	1 — 0 — 0	728	318	7180	2275
	1 — 6 — 0	858	305	7621	2540
	2 — 0 — 0	716	296	11640	2905
	4 — 0 — 0	618	258	8994	2968
	7 — 0 — 0	683	269	6537	2390
	10 — 0 — 0	613	249	6974	2734
7 years	0 — 0 — 1	383	......	2420	....
	0 — 0 — 1	567	188	5410	898
	0 — 0 — 28	660	297	7300	1715
	0 — 0 — 60	675	320	6710	2075
	0 — 0 — 180	687	347	7920	1775
	0 — 0 — 360	665	329	9980	3720
10 years	0 — 0 — 1	412	......	2885	....
	0 — 0 — 3	......	177	....	871
	0 — 0 — 7	537	225	5600	1335
	0 — 0 — 28	603	327	7195	2005
	0 — 0 — 60	717	390	8155	2530

made by him are doubtless somewhat higher than they would have been if made by the earlier operator. At ages of one month or more discrepancies due to this cause should not be large, and a comparison of the results of tests on the fresh and stored cement for these ages is of much value. It should be noted, however, that during storage the cement was well protected from dampness by being enclosed in tightly covered 10-gallon milk cans.

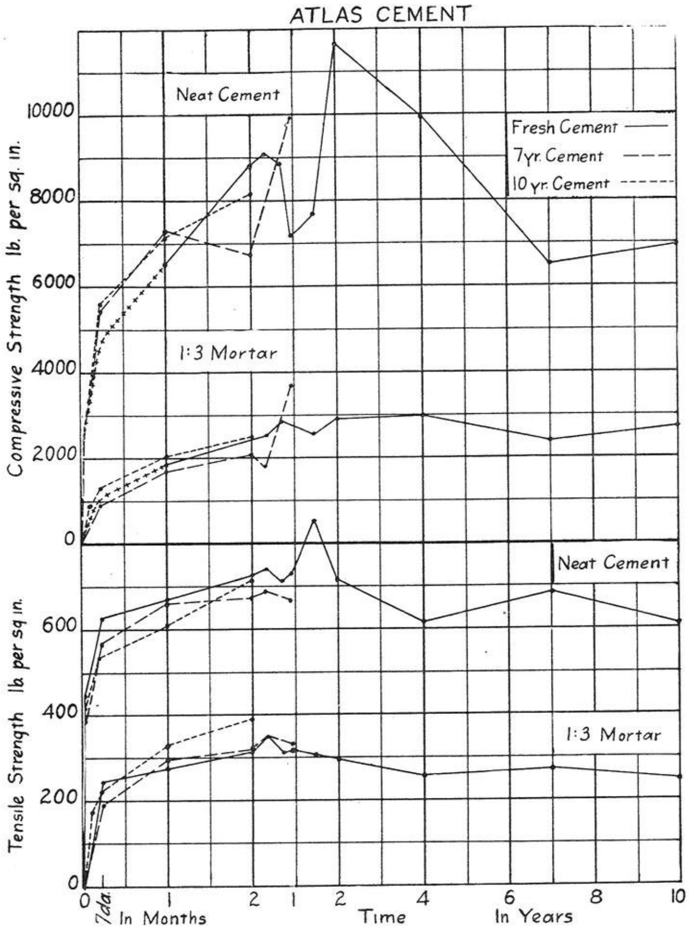


FIG. 2.—*The Effect of Storage in a Closed Milk Can on the Strength of Atlas Portland Cement.*

Conclusions

From the tests thus far completed it appears that the humidity of the surrounding medium in which Portland cement concrete is cured exercises a marked effect upon its crushing strength. Concrete stored in a comparatively dry atmosphere, like the cellar storage, subsequent to a water curing for a couple of weeks, is not likely to increase in strength materially after it becomes a year old. Concrete stored in a more humid atmosphere, or under water, shows increasing strength with age over a much longer period of time. It is also much stronger than concrete subjected to a dry atmosphere. Considering strength at ages of one year or more, the concrete stored out of doors or under water had from 15 to 45 per cent greater strength than like material cured in the dry atmosphere of the cellar.

The tests on stored Atlas cement together with tests on Universal cement subjected to somewhat similar storage conditions for two years*lead one to believe that standard Portland cement may be kept without deterioration for several years, providing it is stored in tight tanks similar to the milk cans used for the Atlas, or the cylindrical galvanized iron grain bins which were used to store the Universal cement. It is interesting to note that the Atlas cement stored ten years in this manner passed all standard requirements save fineness.

*See "Permeability Tests of Gravel Concrete." Journal Western Soc. Engr., November, 1914, Vol. 19, page 814.

TOWN PLANNING RESOLUTIONS ADOPTED BY THE LONDON CONGRESS*

By LEONARD S. SMITH

Professor of City Planning and Highway Engineering

The 500 delegates, representing 30 different countries, which gathered at London last June, reached two important conclusions neither of which is yet generally understood by America, viz.,—

1. That the furnishing of a decent home to all peoples is the most fundamental question confronting the world today; and

2. That the permanent guarding of these new homes through the adoption of modern town planning principles in both their design and zoning arrangements is of primary importance.

The congress recorded the following specifications as necessary to carry out the above principles:

(a) That in order to secure adequate provision of air and light in and around the homes of the people, there should be definite limitation of the number of dwellings per acre and for space adjacent to dwellings, such limitation being a matter of governmental determination in each country.

(b) That the policy of decentralization of industry and the building of garden cities should be encouraged by legislative provisions and by all other means, both public and private.

(c) That each government, acting in partnership with the local authorities, should prepare in advance and carry into effect, a regional survey, followed by planning schemes, with a view of putting to an end all wasteful and chaotic developments and thus insuring that the lines of future growth shall be well ordered.

(d) That in view of the acknowledged necessity of such action the government, acting in co-operation with the local authorities, shall control the direction and assist in the upkeep of main and arterial roads."

*EDITORS NOTE—This is the second of a series of three articles by Professor Smith. The third will appear in the December ENGINEER.

Discussion of Resolutions

If we should plan future living conditions that will insure to the future a better and more virile human stock (as we are now doing with our animal stock,) indeed, even if we are only to insure present standards of manhood and womanhood, we must now set a limit on the further crowding or "sweating of the land" with the new homes we are about to erect. This limit should be set by the local governmental authority and not left to the short sightedness or greed of the private land owners. We must keep in mind that there is only one crop of land and that its use must be husbanded, instead of exploited and wasted. In spite of the overwhelmingly importance of this fact, it is only within very recent years that any attention has been given such matters, especially in the United States. At last it has become very clear that any real and lasting progress in housing our people must proceed along two lines, (a) the decentralization of industry and (b) the constant use of modern town-planning principles, the application of which in all cases shall depend upon adequate and authoritative information of the local facts securable only by complete regional surveys. Piece-meal city planning has always proved a most wasteful and unsatisfactory way of expending either private or public funds. The enormous social and economic waste caused by the war must now compel all countries to adopt scientific methods of conserving time, energy and material.

The excessive centralization of industry in our cities and the resulting phenomenal growth and crowding of city population is the most potent and remarkable fact of the past century. In the United States more than half the population now lives in cities while at the beginning of the century the proportion was less than ten per cent. In Europe the proportion of urban population is even greater and in England is quite 80 per cent. This constantly increasing urban population originates and continually accentuates the great inter-related problems of housing and transportation. Our streets were never laid out or intended for so dense a population, where a single block today may house as many as the entire city of 50 years ago.

Temporary relief has been sought by expensive arcading or widening of our streets, and in extreme cases by the construction of entirely new streets through closely built up districts, while in the largest cities traffic congestion has compelled the building of hideous elevated street railroads or even the construction of costly underground tubes.

The Garden City Remedy

None of these attempts have met the situation, in fact, in many cases they seem to have only made a bad matter worse. The world is now ready for a real remedy and fortunately it is at hand,—the garden city. The London Congress has given its official sanction to the garden city as the most certain and economic method of decentralizing industry and permanently preventing bad housing, and traffic congestion while at the same time largely reducing the high cost of living. Fortunately this statement rests upon the secure basis of actual accomplishment as illustrated in the garden cities of Letchworth, Bourneville and scores of less famous examples. But since the oldest garden city is now scarcely 20 years old, a word of description may help American readers to realize its social and economic significance.

A suitable tract of agricultural land, located on one or more railroad lines, distant not more than about 20 to 30 miles from some large city, is purchased at its agricultural value and a city is laid out on modern city planning lines for a definite maximum population. Materials are purchased in train load lots and thousands of houses, of a most substantial and pleasing architecture, are erected out of funds provided by the sale of both bonds and stock. As a rule two-thirds of the entire city area are

HOUSES FACING THE PARK IN BOURNEVILLE.

permanently reserved for allotment gardens, forests, parks, play-grounds and open spaces. Each house is provided with a lot of at least 3600 square feet with a front yard, used chiefly as a flower garden, and a back garden for vegetables. The latter have been so intensively cultivated as to produce on the average an amount equal to half of the yearly rent.

The agricultural belt is chosen so as to surround the city proper, insuring to the inhabitants all the advantages of both city and country.

Before the houses are finished, industrial companies, harassed by the inadequate supply and the unsatisfactory quality of labor found in the large city, are glad to remove their plants to sites provided by the garden city where they will have the additional advantages of reliable and well housed labor, low taxes and plenty of room for needed expansion. For example, over 50 industrial companies—some of them being branches of American firms—have already established themselves at the garden city of Letchworth* about 35 miles from London. The industrial section of such a city is located adjacent to the railroads and on the leeward side of the city to pre-

*This city now has a population of 8000.

vent smoke troubles, while the workmen's homes are located within easy walking distance of the factories.

The improved labor and living conditions insured by such a system have been found to result in remarkable lowering of child as well as of adult mortality. At Bourneville and Letchworth, for example, child mortality is only 40 per thousand of births as compared with 120 per thousand the average of England or 100 per thousand, the average of United States. Moreover accurate statistics show that the garden city boy of Bourneville is several inches taller and weighs several pounds more, than the boys of same age, born and brought up in the slums of Birmingham only five miles distant.

It is well established that child welfare statistics form the most sensitive and accurate index of housing and living conditions. The human flower, indeed, refuses to grow and bloom normally under crowded conditions which provide filth and immorality instead of sunlight and sanitation.

The following comparison of the life of a workman in a metropolitan city and in a garden city like Letchworth accurately sketches the picture with reference to the other members of the family—father and mother.

Life in Large City	*Life in Garden City*
1. Noise and rush, waste of nervous energy.	1. Natural, vigorous, and healthy life. Conservation of nervous energy.
2. Two or three hours travelling under distasteful conditions with fares to pay.	2. Thirty minutes walking a day under pleasant condition, including that for mid-day meal at home. No fares.
3. Meals away from home, costly and inconvenient, and not like "mothers."	3. All meals at home with the family.
4. Plenty of dust and dirt and little air and sunshine for wife and kiddies.	4. Little dust and dirt and plenty of air and sunshine at home—and in the factories.
5. Suburban dullness, slums squalor, tenements.	5. Ideal City, no slums.
6. No agriculture.	6. Organic contact with agriculture by gardens.
7. An hour away from real country and then a struggle for a bus.	7. Always within easy walking distance of real country.
8. Large taxes and small lots.	8. Smaller taxes and larger lots.
9. Building and land cost high.	9. Building and land cost low.
10. Vegetables old and high in cost.	10. Vegetables fresh from worker's own garden.
11. Death and sickness rate high.	11. Low death and sickness rate.
12. Education expensive because of high child death and sickness rate. No room for recreation around school houses.	12. Education cheaper and more efficient. Plenty of play grounds. Better home influences.
13. Local government complex and poor because of poor citizenship.	13. Local government simple and well ordered. Good citizenship.

By no means does this list exhaust the advantages secured to the family in a garden city. It is high time that all peoples recognize the fact that there is a limit to reasonable and economic growth of cities. Many cities are already too large for the social and physical good of their citizens as well as too large and complex for the economic production and transportation of manufactures. Rather than attempt the costly and radical replanning of their street systems as well as the additional means of transportation required for a larger and more crowded city population, a solution to these great city problems should be sought in the planning and building of numerous satellite or garden cities. Such cities will not only take care of *future* expansion of industry and population but may also even serve to decentralize *present* city crowding. Both results are imperatively needed. Moreover successful examples of such garden cities can be cited both in Europe and in America so that their practicability is fully established.

The establishment of garden suburbs at the immediate city limits is not to be commended. Such suburbs only temporarily improve metropolitan conditions and ultimately must push the country further away from the city, besides adding their population to the already overburdened transit facilities of the city.

PLAYGROUND AND PARK IN BOURNEVILLE, THE OLDEST GARDEN CITY IN ENGLAND.

Democracy has no greater handicap than the evil conditions that mar our greater cities. These conditions are closely connected with bad and inadequate housing of the working man. Enlightenment, public spirit and the larger life never flourish in mean and inhuman surroundings.

If such conditions must be endured in the many century old cities of Europe, no such excuse can be given for their creation and tolerance in our American cities, few of which are even 100 years old.

May we not look forward to the speedy construction of many more beautiful, self-contained and self-supporting garden cities in our own progressive America!

Instructor in Hydraulics, (speaking of a problem in the flow of kerosene from an outlet): "To get the correct result you must have your head in kerosene."

A SIMPLE METHOD FOR MAKING BLOCK DIAGRAMS

By W. J. Mead

Professor of Geology

To the individual who has had sufficient training and experience in the reading of topographical maps the contour map is truly a three dimensional representation of the mapped area. The hills stand out in relief, the valleys are real depressions, and the map conveys at once the exact character of the topogrophy. To the average man a topographic map appears as a two dimensional affair upon which certain peculiar curved lines, which tend to obscure an otherwise perfectly good map, have been drawn. Perhaps he knows that these lines represent elevation and by careful study can make use of them in determining the relative elevations of various points on the map. However, the map does not convey to him anything in the nature of a picture of the area.

To supply the need of something in the nature of a birds-eye view frequent use has been made of various types of block diagrams or stereograms and relief maps. Unfortunately however the making of the block diagrams requires a degree of skill, special training and artistic sense not possessed by the average engineer or geologist. The writer has, for several years, in connection with professional geological work and the teaching of geology, used a type of block diagram which is constructed by simple methods of mechanical drawing and which can be successfully and quickly made by any fair draftsman. The diagrams thus made are isometric projections of a

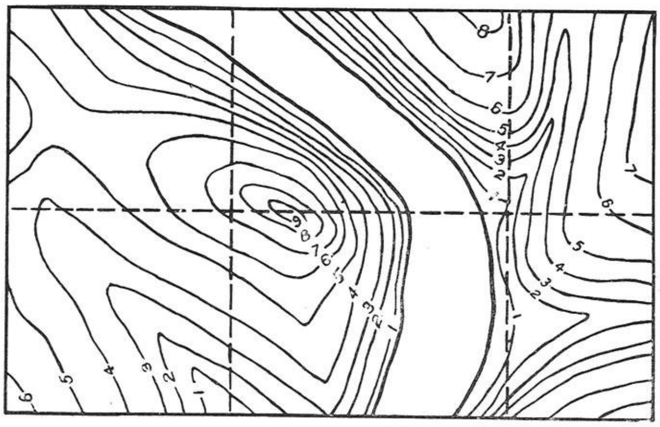


FIG. 1.—*A topographic map with the topography expressed by means of contour lines.*

topographic map. The writer has not seen this method described elsewhere*: but certainly, because of its very simplicity, others must have used the scheme. It is presented with the idea that it may be of service to other engineers and geologists who have occasion to present information or reports to people not trained in the reading of topographic maps.

The method of preparing the block diagram is best described with the aid of illustrations. Figure 1 is a topographic map with the topography expressed by means of contours. Figure 2 is the same map redrawn on an isometric base. Figure 4 is the completed block diagram *which is simply a tracing of Figure 2.* Figure 3 illustrates the manner of making this tracing.

The first step in the making of the block diagram is to redraw the map on an isometric base as illustrated in Figure 2. On this isometric base the co-ordinates make angles of 60° and 120°. (Standard isometric cross-section paper is supplied by any dealer in drafting supplies.)

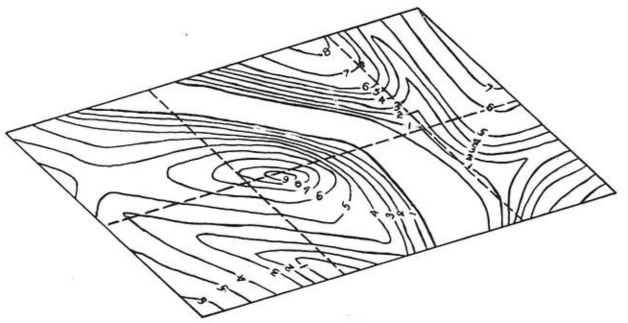


FIG. 2.—*This is the map illustrated in figure 1 redrawn on an isometric base.*

The second step is the projection of each of the contours and other features of the map to its proper vertical position in the isometric drawing. This is easily accomplished as follows: Attach a suitable sheet of tracing paper to a T-square in the manner illustrated in figure 3. On the tracing paper draw a small vertical scale as shown in the upper left hand corner and number the divisions of this scale to correspond with the number of contours on the map. This vertical scale is necessarily an exaggeration of the true scale and the most effective degree of exaggeration can best be determined for each case by trial. A small mark to serve as a pointer is made on the isometric map *beneath* the tracing paper opposite the scale. The tracing paper is then moved so that this pointer registers with the highest contour mark of the scale, and keeping the tracing paper in this position, this contour is traced from the map onto the tracing paper. The next contour is lower than the first and its projection to its proper position is accomplished by moving the tracing paper up until the pointer is opposite the second division of the scale, whereupon the second contour is traced. In this manner each of the contour lines is traced in succession with the pointer each time opposite the proper point on the vertical scale. When a contour line is traced its intersections with any linear features, such as roads, survey lines, streams, or geologic boundaries should be marked so that when the tracing is completed, these points may be connected to represent these features in the completed diagram. Care should be taken to terminate the contours exactly at the edges of the map.

The diagram is completed as illustrated in Figure 4. The edges of the diagram are drawn by connecting the

* Since writing this description the writer's attention has been called to an ingenious method for making a similar type of block diagram, recently devised by a Frenchman, in which a rather elaborate pantograph is employed, and the block diagram is produced directly from the original contour map.

ends of the contour lines. The corners are found by setting the tracing on the vertical scale so that the elevation of the corner as read from the map is indicated by the pointer on the scale, in which position the corner is traced. It should be noted that any point on the flat iso-

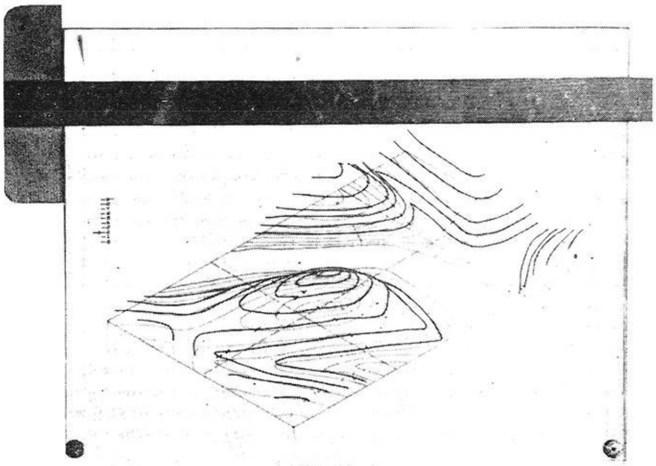


FIG. 3.—*Illustrating the manner of tracing figure 2 to produce figure 4.*

metric map can be located on the relief map by reading its elevation from the contour lines, setting the pointer on the scale to indicate this elevation, and tracing it onto the relief map.

The necessary perspective is given to the relief map by drawing and shading the base as has been done in Figure 4.

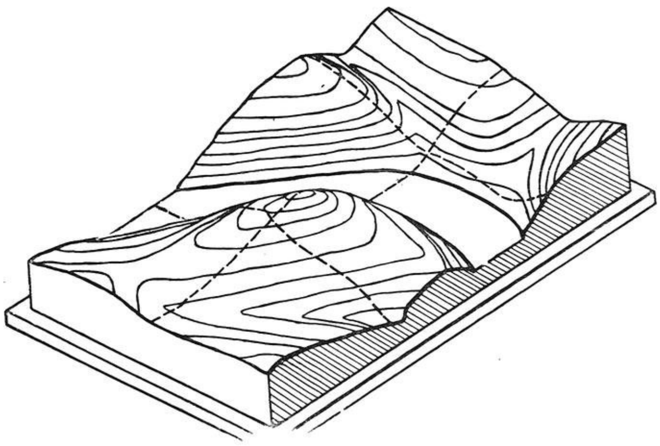


FIG. 4.—*Isometric block diagram of area mapped in figure 1.*

Geological cross-sections may be represented on the sides of the block and the block may be dissected by vertical planes in various manners in order to represent the underground geological conditions.

THE ENGINEERS' MIXER

By Chauncey M. Morley
Senior Electrical

The yearly Engineers' Mixer, held the evening of October 29, was conceded by all who attended, from the Dean to the lowliest frosh, to be an absolute and unqualified success.

A crowd of about four hundred was assembled in Music Hall, and when the program started with the group singing, at least two hundred and twenty-two of them raised their fresh young voices in song, and informed all and sundry listeners that Saint Patrick was an engineer and continued with details of his engineering exploits. After which they issued a blanket invitation to any person or persons desirous of becoming a Badger to accompany them to some unspecified place, illumination for the trip to be furnished by the famous changing luminary of the night—to-wit, the moon. In closing, they stated that they had been working on one of the large transportation systems, the time spent being given as "All the live-long day." A representative of the Brotherhood of Railway Trainmen objected at this point, calling attention to the fact that the union rules prohibited more than an eight hour day, but he was quieted with the assurance that the line would be changed. Further in the song they grew analytical, and advanced a theory concerning the characteristics of the negro heretofore overlooked by the psychologists; namely, that the Ethiopian reaches the heighth of happiness only when he is not confined in some penal institution. This startling theory, which is immensely important if true, so took the breath of the crowd that the singing stopped.

Master of Ceremonies Gerhardt then introduced Dean Turneaure, who mounted the rostrum, and made a neat speech of welcome. He spoke of the function of the mixer as a means of polishing off the rough corners, comparing the students to a number of stones picked up on the farm. This got a good laugh, although the simile was not as all-embracing as it would have if applied to the Ag school, for instance. If the stones were put in a box, and the box agitated, each, through contact with the others, would gradually be worn smooth. Carrying the simile further, he mentioned that after a time the big stones all rose to the top, while the little ones settled to the bottom. He did not mention the finest stones, which go to the bottom, and sometimes do not stop there. With the Sore-eye Special yet to go, perhaps it is as well. He finished with the adjuration to make it a real mixer—to make no distinctions as to faculty or students, but to blow right up and call the professors by their first names.

It may be noted in passing that a freshman, taking the Deans words literally, walked up to Prof. Hyland, shouted, "Hello, Pat," and slapped him jovially on the back. Reports from the clinic state that due to a magnificent constitution, the frosh has a good chance for recovery.

The miners provided a four piece Jazz Orchestra, with Jess Cohn at the piano; Claude Campbell, cornet; Louis Mann, banjo; Jerry Whale, trombone; and Louis Thomas, saxaphone. You had to admit it. When it came to turning a few cubic feet of ordinary air into real jazz music, the lads were there and half way back. At the first blast the bust of Beethoven, overcome at the sacrilege playing jazz in Music Hall where usually nothing zippier than "Poet and Peasant" is heard, fell to the floor, and was shattered. Mr. Campbell, in addition to playing a cornet, put on a short song and dance act that caused all onlookers to concede that he had talent.

M. Flom, with his straw stuffed dummy and ventriloquism, cracked several jokes that were well received. And when the act was over, and the dummy turned out to be Arthur, the son of Prof. Goddard, the entire audience owned themselves amazed and pleased.

The illustrated songs were sung by a quartette consisting of Howard Sharp, James Mackie, James Price, and Claire Congdon. Their performance was excellent. The boys couldn't have done better singing if they had been drunk. The slides, which showed some of the professors in their lighter and more informal moments, were the handiwork of Prof. Van Hagan, and W. P. Zervas, and combined pronounced resemblance to the originals with ludicrousness.

"Doc" Dorward, with George Dorsey playing the piano for him, sang some Scotch songs in a way that would have caused Harry Lauder, had he been among the listeners, to feel for his laurels and see if they were still there. "Doc" combines a good voice, a pleasing personality, and a marked ability to put his songs across. That the crowd liked his singing was amply evidenced by the thunderous applause which he received.

The show closed with a marvelous exhibition of mind reading and fortune telling by the famous Hindu seer and mystic, M. J. Shoemaker. Mr. Shoemaker is very intimate with all of the better class departed spirits, up to and including Three Star Hennessy, and answered the numerous questions which were put to him with ease and aplomb. The questions varied from ones on strictly engineering subjects, such as, "If it takes a snail a week to crawl around the block, how far will a peanut have to fall to kill a horse?", to those of more general interest. Mr. Pitzner was put into a trance by the mystic, and answered some of the questions. It was evident, however, that he was not on as close terms with the spirits as was the seer.

The crowd then went over to the Engineering Building, where each man was given a member of an equation containing four unknowns. As soon as the man holding the answer assembled the group whose numbers satisfied the equation, they formed in line and each received an apple, a doughnut, and a cup of cider. Some made the circuit so many times that they wore a path in the library linoleum.

Many then succumbed to the gnawing of their curiosity, and went down in the basement to see the A. A. E.'s offering, billed as "Bucko—The Only Thing Left with a Kick." Bucko proved to be a burro which some engineer with an aptitude for argumentation had succeeded in borrowing from the Vilas Park Zoo. No empirical data are available as to whether Bucko possessed the vaunted kick. He looked as gentle as an uninvited but hopeful co-ed two weeks before Prom, but the spectators were suspicious, expecially when he reached up and ate four pages out of Ray Owen's book of surveying assignments.

The A. I. E. E. put on a very interesting exhibit, causing an aluminum ring to rise from the table where it was resting, and, apparently defying gravity, float in the air. They also boiled water in an aluminum pan which was held above the top of an ordinary wood table.

The men in charge of the mixer were, Allen Gerhardt, general chairman; C. E. Parsons, C. C. Congdon, P. A. Kurtz, W. Moehlman, A. R. Striegl, program; P. F. Nord, Louis Mann, Arthur Olson, Birney Miller, publicity; H. H. Brown, E. D. Johnson, "eats"; C. Peterson, A. B. Hawkins, finance.

These men, and the performers, merit the highest praise for their hard work, which furnished the engineers with an extremely pleasant evenings entertainment.

MARINE ENGINEERING AS A CAREER

By Robert B. Bohman
Sophomore Electrical

The field of marine engineering is one in which few of our technically trained college graduates have so far cared to enter. As might naturally be supposed, under these circumstances, the foremost men in this field of engineering are the so-called practical men.

Ship building companies of today are fast becoming aware of this situation, however, and are now demanding more and more that their technical men be college trained.

The young man of today who chooses marine engineering as a profession will find it most fascinating in either of the branches of hull design or driving machinery and auxiliaries. A few instances may serve to show how entirely engineering in character the profession is.

There are many classifications of ships, such as fresh and salt water type, deep draft and light draft type, etc. These and many other features in their construction indicate the rare occurrence of two vessels being built exactly the same—each being designed and built for the peculiar conditions under which it is to operate.

Ships of light draft are commonly seen on rivers such as the Ohio and Mississippi, and are either side or stern wheel driven. Many ships of this type are built in this country to ply the rivers of South America, where draft must necessarily be from four to five feet. They are driven by two tandem compound engines working under approximately two hundred pounds pressure, and developing fourteen hundred horsepower.

Contrary to a somewhat general idea, side-wheel steamers are still being built for Great Lakes traffic. These ships are equipped with inclined engines, notwithstanding the much lower cost of a vertical engine, for the purpose of securing easy and quiet operation. The advantages of starting quickly and steadiness in heavy weather are in favor of a side wheel steamer rather than in one that is screw propelled. Since these and many other features are incorporated into ship building, it may be seen that the interests of the traveling public must in all cases be kept in mind by the marine engineer.

The late introduction of the Walschaert locomotive type gear for the operation of Corliss and poppet valves on the side wheel type of steamer,—Corliss valves for low pressure and poppet valves for high pressure,—is an illustration of the necessity for the marine engineer being able to make use of new ideas.

Marine engineers are materially aided by the government in the carrying on of experiments with models in an experimental tank at Washington, D. C. Various ship motions are in this manner noted and formulated.

Engineers are now building some ships according to an Isherwood system, in which the main framing extends fore and aft instead of athwartships. A vessel constructed in this manned weighs approximately ten per cent less for the same strength than one with transverse frames.

A good working knowledge of the business end of his profession is essential to the marine engineer. Many a clever piece of engineering is not financially successful, whereas a little attention to business considerations on the part of the engineer might have made it profitable.

The opportunities for a marine engineer are very great in view of the fact that there never was a greater demand than at present for men in both the design and operation of shops. Our shipyards are everywhere on our coasts, and as the remuneration of this class of industry exceeds that of many other branches of engineering, the men of engineering education are fast supplanting the old type of marine and ship builder.

HOMEWARD BOUND

By Aksel Taranger

Senior Eletrical

With all regard for America, and especially the University of Wisconsin, we who are from a foreign land have a great feeling when we leave it all behind get aboard a ship which has its nose turned the right way; when we know that in ten days we will be dack at the place we called home, and will see the folks and our old friends whom we left behind two years ago. Everybody will be glad to see you, and will want to take you down cellar to show you something. Anyway, we all felt great when the cable was cast loose from the pier and the big steamer slowly nosed its way down the Hudson toward the Atlantic.

There were seven of us, all from the University, and all belonging to the Association of Plumbers. Bryn and Gude had jobs as nurses for two insane Finns, and the only reason why the latter gentlemen did not become further insane was that they were already far gone. The two Ihlen brothers peeled potatoes at the rate of 1550 pounds every day. They were assisted by a Swedish nobleman (at least he declared himself to be such). Tom Norberg started the voyage in the dynamo room, but was promoted to the position of assistant to the chief engineer. The duties of this position consisted of entertaining the girls on the first class deck. At least that was Tom's opinion. Finn Aanesen and the writer had cornered jobs as pantry boys in the third and first class pantries respectively. We devoted most of our time to the noble art of dishwashing, and soon had a fair estimate of the work assigned to us. That is to say, after having carried up the proviant, polished the kitchen brass and cleaned the vegetables, there was left only 3500 pieces of china to be thoroughly washed and cleaned. Our work occupied about fourteen out of the twenty-four hours, so it was not so bad as it might have been.

The Fourth of July came while we were still at sea, so we decided to show our loyalty to the States by a joint celebration. It was a day long to be remembered by all of us. In the afternoon Gude took first prize in the Olympic games held aboard the ship. When you know the prize consisted of a quart of old fashioned gin, you will understand why the competition was keen. The prize formed the basis of a suitable wake held for the Alcohol family that evening, and, needless to say, "a good time was had by all."

Next morning our enthusiasm for work was somewhat lacking, and I did my best to break all existing records for dishwashing as well as the dishes.

However, it mattered little. The same morning about nine o'clock we sighted the coast of Norway, and it was a sight more beautiful than my imagination had ever pictured it. All the little islands, so barren in winter, were shining in the various tints of green, brown, and yellow, and in the background towered the clear outlines of the mountains. Little work was done; as we approached the shore we all stood at the rail and gazed ahead to where the fjord opened, and at the town lying at the foot of the Seven Mountains. Though it was not our home, the town gave us our first chance to set our feet on the soil of our native land, and to hear the language which we had not heard save when we had spoken it among ourselves.

After another day and night, our voyage came to an end. At half speed the steamer went up to home fjord and we saw Kristiania, our home town, lying surrounded by the hills, save where the fjord broke through. There were murmurings among the passengers, and low exclamations, as they pointed out the old familiar sights. At last the longed for moment came, and we went ashore to be greeted by the folks and friends whom we had left so long before.

ROAD WEAR AND RESISTANCE TESTS

Such important questions as how hard a heavy motor truck pounds a pavement when going at five miles an hour and at 15 miles an hour are being answered by investigators for the Bureau of Public Roads, United States Department of Agriculture, in a series of scientific experiments, which, when completed, promise to be of great value to highway engineers. Already sufficient tests have been made to show that increased speed of a vehicle equipped with hard rubber tires tremendously increased the impact which its wheels make on the roadway where there is any unevenness. On the other hand, where pneumatic tires are used increased speed adds comparatively little to the impact. It has been suggested that these tests will be of great value not only in settling questions of design but may also lead to a rational basis for determining license fees for motor vehicles.

Trucks have been used in these tests varying in size from a 1-ton truck up to a 7½-ton truck carrying an excess load. Each truck was run over a special recording device embedded in a roadway and the impact which resulted when one of the wheels made a 2-inch drop from a ledge built in the surface caused the deformation of specially prepared copper cylinders forming part of the apparatus. The magnitude of the blow was accurately ascertained in pounds by measuring the extent to which the cylinder had been forced out of shape.

Recent tests were made with a 3-ton truck of well-known make loaded with a 4½-ton load so that the total weight on each rear wheel was 7,000 pounds, the unsprung portion (that not supported by the springs) being 1,700 pounds and the sprung portion (that portion supported by the springs) 5,300 pounds. The truck was equipped first with an old solid tire that had been worn down to a thickness of one inch. Then, with exactly the same load on the truck, a wheel was used fitted with a new solid tire 2½ inches in thickness. And finally, the truck was equipped with pneumatic tires 42 by 9 inches and blown up to a pressure of 142 pounds per square inch. The following table shows very clearly the bad effect an old tire is likely to have on a road surface and the greatly lessened impact produced by trucks when they are equipped with pneumatic tires. The tests show that as the vehicle's speed increased the impact from the old hard rubber tire increased greatly. The impact from the new hard rubber tire was somewhat less.

Approx. Speed	Height	Old Tire	New Tire	Pneumatic Tire
5.7	2″	11,600	9,400	7,100
10.2	2″	18,500	14,100	7,800
14.6	2″	26,500	18,700	8,300

Related to these tests is another series which utilizes the figures secured in the first experiments. A number of paving slabs were tested by means of a machine designed to give impacts equivalent to those produced by the rear wheel of the heavy truck already referred to. The unsprung portion of the weight of this machine is 1,500 pounds and the sprung portion weight 6,000 pounds. The tests were made by raising the entire weight through a height of ⅛ of an inch, allowing it to fall 500 times, then to a height of ½ inch with 500 repetitions, then ⅜ inch more in height, and so on until the slab failed. To date about 12 slabs have been tested, laid on a rather wet subgrade. A surprising difference has been found in the strength of the different types of pavements tested. The total number of blows required to cause failure have varied with the different slabs from 67 up to almost 2,000. All these data promise to be of the greatest value to engineers in selecting material for roads of various types.

Relative Wear of Different Pavements

The Bureau of Public Roads is also making a study of the relative wearing qualities of different types of pavements and tests have been about completed on a short section of pavement containing 49 different types subjected to the wear of a special truck equipped with five large cast-iron disk-like wheels. The relative wearing qualities of hard as compared with soft brick are brought out very distinctly in this test. The resistance to wear of various kinds of stone block sections is also shown up to good advantage. A chance to compare grout and asphalt fillers for both brick and stone block is furnished by this investigation. Likewise, the relative wearing qualities of concrete when mixed with various kinds of coarse aggregates is indicated.

Investigation of Subgrade Materials

The investigation of subgrade materials started a few months ago with the cooperation of the District engineers and State engineers is proceeding at a very satisfactory rate. A number of samples have been received from various parts of the country and laboratory analyses of many of these samples are partially completed. The methods being used by the Division of Tests will shortly be published as a paper so that any other laboratories wishing to conduct similar investigations may have some guide as to the method of procedure being followed by the Bureau of Public Roads.

The samples analyzed have been taken from parts of the roads that have failed very badly as well as from adjacent parts of the same roads that have withstood heavy traffic successfully. It is hoped that by a comparison of the laboratory results on these samples with the reported behavior of the road in service differences in the subgrade materials will become apparent so that we will be able to say what physical characteristics soils must possess to give them high bearing value.

U. S. Dept. of Agriculture.

THE ENGINEER REPORTS A CASE OF EMERGENCY

The following episode will be of exceptional interest to engineers familiar with the practice of making out reports. The author is an engineer employed by a large manufacturing corporation who was taken ill with appendicitis, and after surviving the customary rites guaranteed in such performance—the alienation of his appendix—despatched this account of the circumstances to the head of his department.

Dear Boss:—Arrived customer's plant Thursday the 13th. Spent day taking levels, running lines, establishing clearances, cleaning up, etc.

Friday the 14th, opened bottle of ether waves, experimented with same. Visited Mars, the moon, Venus, etc., while Master Mechanic and pipe fitters opened chest and looked for cracked fitting; finally found same and removed it.

Saturday the 15th, and Sunday the 16th, delayed account of trouble with pipe lines, etc.

Monday the 17th, started fires with light fuel and got steam turned on lines.

Tuesday the 18th—General lining up, grouting, etc. Will operate on light load shortly, full load in about 10 days. Work 35 per cent completed. Did not replace defective fitting.

"Shorty" Baumeister.

EDITORIALS

UNIVERSITY REGULATIONS

Seventy cases of dishonesty in studies were reported to the faculty last year. This means that about one per cent of the University students were caught trying to "get by." Although this is a seemingly small proportion of the total, it is a much larger number than has ever before been recorded. There may be some question as to the cause of this dishonesty, but there is none as to its effect on the student. The University regulations are the results of experience with students, and must naturally be affected by cases which come before the Discipline Committee. There need be no wondering, on the part of the student therefore, at some of the rules of the University, nor any chafing if some of them seem too restrictive. The faculty have all been students at some time or other, and have not forgotten their undergraduate days. Even the so-called "fogy" is possessed of ability to know his students, and the fact that he does is the cause of marvel expressed at the end of the semester in the half whining remark, "Gee, I thought I was 'getting by' strong, and he gave me only a poor," followed by some choice descriptive adjectives. With some rare exceptions, an appreciation of the exact position of the faculty by the student is keenly noted by the former, and of the qualifications expected in a student, honesty is a premier one expected of all. When it is not found, is it any wonder that rulings are made, which, though restraining on some, serve to keep just and unjust on an equal footing?

A JOINT COMMITTEE

As this issue goes to press word comes to us that the U. W. Engineers' club, and the Chemical Engineers' club have each appointed a man to confer with the other societies in regard to forming an Engineers Executive Committee to have charge of activities such as the Minstrels, the Mixer, or the St. Patrick day celebration.

Las spring we suggested just such a committee in this column to take the place of the Student-Faculty committee, or function where it did not. It was then too late in the spring to do anything, but the beginning of the year presents a splendid opportunity to form such a committee composed of a representative from each of the Engineering clubs to take charge of the all-Engineers functions which come during the year.

The present system has proved itself signally inadequate, as things always go to the last minute, and consequently suffer unless some one club takes the responsibility. The Commerce and Agricultural colleges have such committees, and they function well. If we are to have efficient and satisfactory management we, too, must have centralization. The only way to have such a committee is for each of the six student clubs to appoint a man—a live wire, not just a regular attendant—and have the six organize themselves. The need is clear and urgent. Let's do it NOW! —————— B. I. M.

IS OUR PRESENT CLASS SYSTEM INADEQUATE?

Various prominent educators have recently raised the question as to whether or not it would be better to return to a system of education which prevailed in our colleges before the present one was developed. Under the old system, a larger share of the student's time was devoted to lectures and to a careful consideration and digestion of notes on those lectures. More attention was paid to the physics of engineering and less to the mechanical or practical part.

However, a return to the aforementioned lecture system of instruction involves a consideration of more factors than those relating to instruction itself. First, there is the fact that the engineer is no longer the type of investigator and designer which he was formerly. He must handle men as well as materials, and the present educational system, with its accompanying extra-curricular activities appears to be far better than the old system. It is a better approach to—though not an exact duplicate of—the present highly organized economic and industrial life in which the engineer must live and work after graduation. Since it is a nearer approximation than the old system, it would appear that the present classroom and laboratory work, accompanied by what might be termed an elementary course in management which is obtained through campus activities, is as good as any other system.

For the student whose mind is adapted to solving problems of design and physics, the lecture system might be somewhat better. His mind is well suited to such a lecture program, and he would take a keen delight in listening to teachers of national prominence and in carefully digesting notes of those lectures instead of using texts. But much of the graduate work in our universities is still done in that manner, and to suit himself best for research or design, one ought to pursue graduate studies. In so doing, therefore, he will obtain the benefit which is to be derived from the lecture system. The allowance of more time for reading and study would, in the majority of instances, be unwise. Those whose minds tend toward reading and study of the works of great scientific men will find the time for that even though their time is as fully occupied as it is in our universities today.

But is not this type of student in the minority? Would not the greater number of the students fail to utilize additional time granted them but fritter it away as they do so much valuable time at present?

THE SILVER LINING

Hard coal is twenty dollars a ton in Madison this fall. Every time a professor throws a shovelful of coal into the furnace he says goodbye to ten cents, which will account in part for the wild and haggard air the faculty will wear during the winter. It is going to be hard work to keep the houses warm enough for B. V. D.'s and georgette waists. Such are the economic effects of peace. And yet, to the optimist, there is a silver lining to the cloud of high priced coal dust. If we may judge by the quantity of slate we now receive with our ton of coal, the miners are now taking it out pretty close to the rind. We have been told in the past that American miners took only the easy pickings and left large amounts of coal behind them in such shape that it could never be taken out. It would seem that they can now take out anything that is black and get a good price for it. Apparently they are leaving nothing behind. If this is so we must credit the war with a noteworthy bit of conservation. We are told that the coal supply in sight is sufficient to meet demands for 4000 years. So forty centuries from now—about the time when the coal would otherwise have played out—we may expect future generations to arise and give thanks for the tribulations heaped upon us in this year 1920.

OIL FROM STONES

Much of the specialization in the different courses is done in the senior year, and, while the subject of specialization is still a debatable one, those who contemplate entering the chemical engineering field would do well to investigate the opportunities afforded in the distillation of oil from shale. The shale oil industry is still in the promotion stage, for the most part, and those who enter that kind of work within the next few years, whether the engineering or commercial phase, are in "on the ground floor" of it. Besides offering a fertile field for improvement, there is also the opportunity for the engineer to invest his money profitably as a result of information not available to the public at large.

THANK YOU!

After the appearance of the first issue of the ENGINEER, the editor was the recipient of comments and suggestions, varying from comparison with a well known religious publication to commendation. He hopes that such suggestions continue to come, as it is only by receiving them that the magazine may be made what its readers desire. It is hoped that the present issue is more the ideal of our readers. Another issue will see the magazine well formed for the year.

GOOD ETHICS AND GOOD BUSINESS

The question of the relation of ethics to good business was at one time a debatable question, and even at the present time there are indications that the proposition is not settled. However, it seems that after careful consideration by anyone, he might come to the conclusion that these two are one and the same thing. What is sometimes meant by good business is the conduct of ones affairs so as to benefit the individual most. In the end, however, any business which does not make a friend with every sale or contract is bound to be a failure. Customers can no longer be sold machinery, they must be sold service as well, and if this is done in accordance with ethical principles, good business will inevitably result.

ENGINEERING REVIEW

By M. A. Hirshberg

Iron and Nickel Alloy Thermo-couples

The "Elektrotechnische Zeitschrift" gives a comprehensive study, made in Germany, to find out what service thermo-couples without platinum, or others of the expensive noble metal group, will give when used for high temperature measurement. The article contains a great deal of tabular material from which may be gathered that several of the tested couples would give readings accurate within ten degrees centigrade, even after a hundred hour run at 1,200 deg. C. Thermo-couples of nickel-chrome alloys, and of a 6 per cent nickel-steel composition were particularly resistive against abuse as were also those with a carbon tube for one electrode. In the carbon tube type, the other electrode was a nickel wire, carried inside the carbon tube, in an insulating tube of porcelain. The connection was made by a screw clamp.

Ductile Nickel-Cobalt Alloy

The General Electric Co., has recently patented an alloy of nickel-cobalt. It has been found that the nonductility of the alloy at ordinary temperatures was due to the presence of carbon, and that such an alloy free from carbon, sulphur, phosphorus, and basic impurities is ductile.

An alloy containing twenty to thirty per cent by weight of cobalt, and seventy to eighty per cent of nickel is produced in a Coolidge type electric furnace, in an alundum crucible, special precautions being taken to prevent contamination with the impurities mentioned, and when melted about two parts of manganese is added. This alloy may be rolled from 0.5 in. to 0.02 in. without intermediate annealing, and is particularly suitable as a supporting and current lead wire for electric incandescent lamps, as it has but a slight tendency to volatilize and spatter electrically. It has a low heat conductivity and therefore increases the efficiency of electric lamps, particularly in the case of miniature low voltage lamps.

Oil Shale

According to Chemical and Metallurgical Engineering, there is no need to worry over the shortage of gasoline which we are supposedly to experience in a few years. There are many millions of tons of oil shale deposits which will yield from ten to eighty gallons of oil per ton, and from 20 to 100 pounds per ton of nitrogen in the form of ammonium sulphate, the amounts varying with the analysis of the different deposits. If the shale is of a lime base, the residue shale may also be profitably used in the manufacture of Portland cement. One reason why the industry is as yet undeveloped is that plants that have been tried were too small for economical operation. A profitable plant is one that is operated for 24 hours a day throughout the year; one that has an output of about 2,000 tons per day, and one that has a staff of experts competent to attend to difficulties that may arise. The cost of mining, crushing, power and wages, and retorting, for a small plant is $1.13 per ton; for a plant of economical size, 29 cents per ton of shale. The cash returns from the sale of byproducts alone is enough to cover the total operating expense. The oil sales would then measure the profit. The industry will undoubtedly soon be of great importance.

Hardening of Iron and Steel

According to a recent patent, an aniline dyestuff, such as auramine or methyl violet, is used in hardening iron and steel. The material in powdered form is either mixed with salt, saltpeter, and carbon, and spread over the surface to be hardened; or a solution in ammonia water may be used for quenching.

Treatment of Waste Pickling Solution

The waste liquor, from sheet, plate, or wire mills, is forced through spray nozzles into a furnace so heated that the temperature at the top is 1,200 deg. F. and at the bottom it is about 1,500 deg. F. The vapors which result from the evaporation of the solution and the decomposition of the ferrous sulphate, pass over a catalyzer which converts any SO_2 to SO_3. They are then condensed in the form of sulphuric acid. The iron oxide deposited in the furnace is in an extremely finely divided state, and hence is very valuable as a filler or as a pigment.

Peat for Gas Producers

The U. S. Geological Survey calls attention to the use of peat in gas producers properly designed for the purpose. Peat will give a gas of as good a quality as coal, and in greater quantity. There are also valuable byproducts which may be obtained when peat is used. It is believed the gas producer will make possible the most effective utilization of peat fuel for generating power, because when peat is used in this manner, it does not have to be so carefully prepared, or so thoroughly dried as when it is consumed directly under a steam boiler. This utilization of peat in gas producers opens up an enormous supply of fuel for power purposes in a great many parts of the world.

First Electrically Propelled Ocean Freighter has Trial Trip

The "Eclipse," the first general cargo merchant vessel to be electrically propelled, was given its trial trip on Tuesday, October 19, in and about New York harbor by the United States Shipping Board. The ship is 440 feet long, and has a dead weight capacity of 11,868 tons. Its propulsion machinery consists of an adjustable speed, (20 to 110 per cent) marine turbine generator set, and a 3,000 hp. three phase induction motor which drives a single propeller.

American Gold Dredge for New Zealand

An example of the far reaching extent of American enterprise is to be found in a gold dredge which was designed in New York for operating in New Zealand gold fields. The hull is 115 feet 6 inches overall, beam 50 feet, depth 11 feet and is built of Kauric pine. Power for dredging, pumping and shifting position is furnished by electric motors operated by four men on a shift. Records show that this type of dredge operates on a cost basis of 6½ cents per cu. yd., and that 418,745 cu. yds. have been dug in a period of two years.

GREAT LAKES SEAPORTS

By A. Rollin Striegl

Senior Civil

At various periods during the past two decades the populace of the Northwest has been facinated by the idea of direct communication between the Atlantic Ocean and the Great Lakes. One of those periods is now at hand, having been brought forth by the signal failure of the railways to care for the transportation needs of the country.

Today newspapers come from the press bearing captions such as: "Make Milwaukee a Seaport," and "Duluth to Liverpool in One Bottom." The idea apparently appeals to most of the people chiefly because of its magnitude, few realizing the important effect that such a waterway would have on the industrial life of the country.

The States bordering on and tributary to the Great Lakes are sometimes spoken of as "the cream jug of the continent." That section says R. G. Skerrett, in the Scientific American, while "occupying but one-third of the national area, * * * produces something like seven-eighths of our principal staples, exclusive of cotton and tobacco. Upon its fertile fields are 75 per cent of our wheat; 65 per cent of our corn; substantially all of our flax; half of our potatoes and sugar beets; 50 per cent of the country's cattle, dairy cows, and swine; 60 per cent of our horses." The most productive of our iron mines and three-quarters of our coal reserve are in the same zone. It is thus readily seen that a Lake-to-Ocean waterway has one of the first requisites for success, i. e. a productive tributary country at one terminus. At present millions of bushels of grain and hundreds of shiploads of meat produced in the Northwest are exported to European countries annually. If shipped via the Great Lakes, the New York Barge Canal, and the Hudson, all this produce must of necessity suffer three transhipments with the attendant delay, damage, and expense. If shipped by rail, the congested conditions of the railways, warehouses, and ports are met. While delay and inconvenience in the transportation of produce may not always operate to the disadvantage of the immediate owner of the goods, they are always expensive to the people as a whole and should be avoided. The inability of the railways to fill the country's transportation needs adequately, —which inability must necessarily continue for a decade or more—furnishes another great incentive to open communication by water.

Today influential men in all cities of the Northwest are boosting the St. Lawrence route as the one which should be improved for navigation by ocean going vessels. Reliable engineers have estimated that the completion of our country's share of that project will cost about $100,000,000. Completion of the project as outlined would mean that Duluth, Superior, Milwaukee, Chicago, Detroit, Toledo, Cleveland, and Buffalo would have unhampered outlets to the sea.

The chief natural obstructions to the proposed waterway are the rapids between Lake Ontario and the village of St. Regis, and those between St. Regis and Montreal. By cooperation between the United States and Canada, dams could be built to flood these rapids and provide a wide and deep waterway from the mouth of the St. Lawrence to the ends of the Lakes. The water pouring over our country's share of the international dams would be capable of developing about 1,000,000 horse power of electrical energy. The power generated could be readily distributed to the growing industries of New England; and, besides furnishing a yearly revenue of no mean amount, would aid in the conservation of the nation's coal supply.

Of course we should not blindly advocate any such project as the proposed deep waterway. There are factors adverse to its success which should be considered. One of these is the expense of operation of ocean-going craft on inland waterways. Ordinarilly, says T. Brent (Jour. W. Soc. of Engineers, Vol. 24, p. 359), "what you want on an internal operation is a wide shallow craft; (while) what you need for the ocean is a narrow deep craft. The two do not go together at all." This difference has been met in the proposed channel by avoiding narrow canals and providing wide and deep waterways over which ships can operate at full speed and economically. Large terminals must be provided at lake ports to insure the success of such a trade route. Grain and ore docks of the most improved type are already available at the lake ports and the enterprising cities affected can be relied upon to provide docks for other freight. There might perhaps be difficulty because of the international character of the route; but, in view of the harmonious relations of the past trouble from that source must be considered as remote or non-existant.

In view of the many great advantages which it is evident would accrue to the nation by having a water route from the Great Lakes to the Atlantic Ocean, every effort should be made to discourage the expenditure of national funds to make navigable some creek in the home state of Senator So-and-so, and to encourage the concentration of expenditures for inland waterways on a project of recognized merit which will make our largest mid-western cities sea-ports.

ALUMNI NOTES

By David W. McLenegan

A paper on Fatigue of Metals Under Repeated Stress by Prof. H. F. Moore and Prof. Jesse B. Kommers. e '06, both of the University of Illinois, was read May 28, before the American Iron and Steel Institute.

Do you remember, Old Timer, how you used to go down to Johnny Hamacher's place and take one of those "internal baths,"—the kind you quaffed out of a two-handled mug which no real he-man put down until he had "crossed the Rubicon?" Its many a long year since the Demon Rum was banished from John's place; but the memories still are green. Well, John "cashed in" this summer, on August 21, aged 65. He was a native Madisonian, born in the hotel that bore his famous name and that was then owned by his father. The hotel still bears the family name, although it is now owned by a stranger.

Charles P. Barker, g '07, is with the Mid-West Box Co., of Chicago, Ill.

W. Otto Baumann, ch '20, is with the People's Gas & Coke Co., Chicago, Ill.

"Bill" Bellack, m '19, a former member of the staff of ENGINEER, visited us October 29. He is now in the clothing business with his father at Columbus, Wisconsin. Practical experience has not dulled "Bill's" sense of humor, and we think he could still write Campus Notes.

Ray E. Behrens, c '19, former business manager of the Engineer, with his wife, is living in British Guiana. He is working on bauxite mining for a subsidiary branch of the Alumnium Company of America. Ray is also collecting a lot of tropical specimens (?), though he did not say what kind.

W. F. Blair, m '15, is working with his father in the management of a grey iron foundry under the name of F. C. Blair & Son, located at Waukesha, Wis.

H. A. Blau, c '20, is with the State of Illinois as junior highway engineer on field work in southern Illinois. Previous to this time he worked for Thomas A. Edison, Inc., Orange, N. J., as assistant service engineer in the Power Service Division, where he worked under the personal supervision of Thomas Edison himself. His address is care Division of Highways, Brush Bldg., Carbondale, Ill.

Alvin C. Braun, ch '20, is with the Ozone Co. of America, Milwaukee.

Erwin C. Brenner, ch '19, Ch. E. '20, is Assistant Superintendent of the Milwaukee Gas Light Co., West Side plant.

Arnold E. Broenniman, c '97, died on May 29, 1920, at Watertown, Wis.

Thorwald A. Carlson, ch '15, has completed his work in connection with his Metallurgical Research Fellowship in the Department of Metallurgical Research, University of Utah, and is now in the Testing Department of the Anaconda Copper Mining Co., Anaconda, Mont.

Hoy Clayton, c '15, and C. W. Blodgett, c '17, are associated in the Blodgett-Clayton Construction Company, with offices at 204 Grand Ave., Milwaukee.

Clarence E. Cooper, ch '17, is at the Palmerton, Pa. plant of the New Jersey Zinc Co.

Ronald I. Drake, ch '20, is with the Kimberley-Clark Paper Co. at Niagara, Wis.

S. Harold "Cy" Edwards, c '16, resides in Janesville with his wife and two children. He is employed in the engineering department of the General Motors Co.

Ernest J. Fisher, c '04, is with the United States Geodetic Survey, and has recently returned from a survey in Central America.

H. H. Force, e '10, gives his new address as, 422 N. Kensington Ave., La Grange, Ill.

G. G. Frater, c '20, is general superintendent of the Louis Beeware Mfg. Co., Watertown, Wis.

Arthur F. Fredricksen, m '18, is now sales manager and assistant sales manager for the Waukesha Motor Co., of Waukesha, Wis.

H. H. Fuller, e '18, returned here on the first of November to instruct in the department of electrical engineering. He received an ensign's commission at the Stevens Institute of Technology, Hoboken, N. J.

F. P. Gerhardt, ex-c '17, sends his subscription from Egypt. He is assistant engineer on the S. S. Seekonk, Grace Lines, and may be addressed at No. 10, Hanover Square, New York City.

James E. Gillespie, c '08, formerly assistant construction engineer with the Wisconsin State Highway Commission, has become Assistant to the President of the Marquette Portland Cement Co., to take effect Nov. 1st.

Paul C. Gillette, C E '18, resides at 319 Morrell Place, Johnstown, Pa.

Frank L. Griswold, ch '20, is with the Westinghouse Lamp Co., at Bloomfield, N. J.

"Moose" Hanson, c '19, who is with the Worden-Allen Co. of Milwaukee, gives his present address as 535 Fourth St., Niagara Falls, N. Y.

William C. Helmle, ch '17, is with the American Telegraph and Telephone Co., New York.

G. A. Hill, ex-e '22, arrived here recently after making a visit to England. He expects to resume his studies starting next semester. He would have started this semester but for his late return, caused by the breaking of a propeller of the ship on which he was returning to this country.

S. C. Hollister, c '16, of the firm of Wig, Hollister & Ferguson, announces the removal of the offices of the firm to 531 Land Title Building, Philadelphia.

E. E. Hunner, c '00, C E '07, was a recent visitor here. He is general manager of the iron mines of the M. A. Hanna Co., Duluth, Minn. Previous to this time he was engineer and chief engineer for the Oliver Mining Co,, in the Hibbing district, but upon the surrender by the United States Steel Corporation of the Hill leases, he was made general manager of the Arthur Iron Mining Co., formed by the Great Northern Railway Co. to take care of its mining interests.

Paul Huntzicker, c '18, is working for a construction company and is in charge of a central heating plant at Julesburg, Colo.

R. K. Lane, m '17, was visiting old friends around the Engineering College on October 6, 1920. He is with the Southern Illinois Light & Power Co. at St. Louis. This company is part of the Great Northern and Southern Illinois Light & Power Co. of which Wm. A. Baehr, c. '94, is president and "Tom" Lucas, e '07, is operating engineer.

Anton Mathy, ex-c '22, is working for the City Engineer of Green Bay, Wis.

Keith S. McHugh, ch '17, is with the American Telegraph and Telephone Co., New York.

EDWIN E. MEISEKOTHEN, ch '20, is with the French Battery & Carbon Co., Madison, Wis.

GEORGE C. NEWTON, m '07, vice-president of the Newton Engineering Company at Milwaukee, writes, "Have found the Wisconsin Engineer very interesting. Best wishes for the coming year." We like such expressions of opinion, and shall cherish the good wishes, for verily, we shall need them.

JOHN J. OBERLY, ch '20, is now with the Federal Rubber Co. at Cudahy, Wis.

BERT H. PECK, e '05, is general manager of the Southern Illinois Light & Power Co.

MARTIN POWERS, ch '17, is located at the Palmerton, Pa., plant of the New Jersey Zinc Co.

ORVILLE RADKE, e '20, is with Hagenah and Erickson, a firm of utility consultants in Chicago.

TEOFILO REYES, c '15, who is with the Bureau of Public works in Manila, was married last May to a girl from his home province of Bulacan. He writes that he is studying law and that his intention is to practice that profession is soon as he is qualified.

JOSEPH A. REINHARDT, ch '17, is with the Western Clock Co., Peru, Ill. He has charge of the heat treatment department and laboratory.

WALTER H. SACKET, c '06, is with the Forest Products Laboratory, at Madison, in the box testing department.

"JIMMIE" SCHAD, c '16, was married during the summer, according to good authority.

H. C. SCHMIDT, c '14, is assistant city engineer in Milwaukee, Wis.

"FRITZ" SCHUSTEDT, c '17, announces the arrival of a daughter, on October 4. Fritz is temporarily with the Madison Water Works department.

ALBERT G. SCHUTTE, ch '20, is with the Solvay Process Co, Syracuse, N. Y.

EDWARD MARVIN SHEALY died of heart failure at St. Mary's hospital, Madison, on October 6, 1920. Death followed an heroic fight against ill-health which had extended over many years. He leaves a widow and one son, Edward Jr. At the time of his death he was associate professor of steam engineering in the Extension Division at the University of Wisconsin.

Professor Shealy was born in Cumberland, N. C, in 1877. He was educated at Clemson College, South Carolina and at the University of Wisconsin, graduating from the latter institution in 1904 with the degree of B. S., electrical engineering course. He has been a member of the faculty for sixteen years during which time he wrote a number of text books.

LEWIS R. SHERBURNE, c '20, is working for the Miami Conservancy District. His address is 34 N. Monroe St., Troy, Ohio. He writes, "They put me up here as instrument man on the Troy Local Improvement job. The work consists chiefly of levee construction and channel improvements, but with lots of variations to make it interesting. There is one thing in which I am disappointed. I expected every one to be in favor of this flood protection work and that the engineers would be the heroes. There is bitter opposition to it however, and instead of us being heroes, we're "damn fools." It's really funny to hear the people tell how terrible the flood was, and then have them curse the Conservancy."

R. M. SMITH, c '13, is assistant city engineer in Kenosha.

ALLEN SPAFFORD, ch '20, is with the Madison-Kipp Lubricator Co., Madison, Wis.

JOSEPH A. STAIDL, ch '20, is assistant engineer in the Pulp and Paper Section, Forest Products Laboratory, Madison, Wis.

R. E. THOMAS, ex-m '16, gives his address as Box 626, Y. M. C. A., Butte, Montana. He states that he is taking work in metallurgy at the Montana State School of Mines.

W. R. STEELE, c '20, is at present working with the W. W. Steele Lumber Co., Lodi, Wis.

THOMAS UTEGAARD, c '17, is engineer for the Consolidated Water Power & Paper Co., of Wisconsin Rapids, Wis.

H. D. VALENTINE, formerly an instructor in the Chemical Engineering Department, now with the Thomas Meter Department of the Cutler-Hammer Co., was in Madison recently installing a new meter for the Madison Gas and Electric Co.

WALDEMAR VELGUTH, ch '20, is in the heat treatment department of the Buick Motors Co., at Flint, Mich.

J. L. WALTON, ch '21, has entirely recovered from his illness and will return to the University in January. At present, he is at home at Moorestown, N. J.

"ED" WISE, e '19, flits about the campus now and then. Besides a broken arm resulting from an automobile accident, he is the same "St. Pat" he used to be.

J. P. WOODSON, c '16, was recently married at Atlanta, Ga. He is employed as engineer for the Dixie Construction Co. of the Alabama Power Co., at Birmingham, Ala.

ENGINEERING SOCIETIES

The Chemical Engineers have bounded into the social limelight with two successes to their credit. A stag mixer for all chemicals was held on October 22. Profs. Kowalke, Watts, and Mr. Hougen gave short talks, and Milton J. Shoemaker put on a clever mind-reading act. The other affair was the dance on November 5 in Lathrop Parlors. Boyd's first orchestra furnished the music.

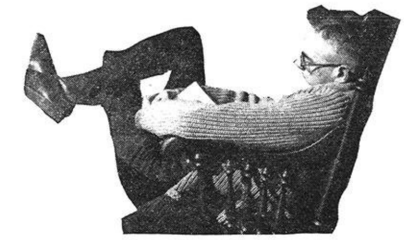
Short talks, by students, on engineering subjects have made up the programs given by the Engineers' Club at its weekly meetings. The object of the club is to train men to speak in public, and the programs have been a good means for accomplishing that object. All engineers interested are invited to attend the meetings.

The A. S. M. E. held its annual initiation on October 14. St. Pat presided over the installation of twenty-five new men with his usual dignity and good humor. The formal initiation was followed by eats served in the Engineering building and by an Orph party. The social committee is making plans for a dance, the exact date of which will be announced later.

On the night of October 20th, the Miners assembled in the Mining Lab for the first of the year's monthly feeds. About fifty shoved their feet under the boards at the call for chow, and for half an hour the beef steak, baked potatoes, buns, coffee, and apples disappeared in quantities we would be ashamed to mention. The program was then opened by President Mark Link, who welcomed the new men and explained the club's purpose and the year's program. Prof. Mac followed with a talk on the summer trip, which is to be compulsory for Miners from now on, and told of its benefits in establishing relationship in the profession, and broadening one's technical knowledge. Songs of the old countries in the native tongue were given by Hussissian, min '16, who sang the Marsellaise, the national hymn of the new Czecko-Slovak republic, and an Indian love ballad. Tsao, '21, gave two songs in Chinese. Stories of last summer's trip were told by Walters, Link, Lundberg, and Jordan.

CAMPUS NOTES

By Frederick W. Nolte



Thanksgiving? Um! Turkey? Uhuh! Full stomach? Oh gosh!

Is there a laugh left in you after seeing the Minstrels? If so, you did not go prepared to laugh your best.

Oh, you cafeteria quest! The average student is lucky to have the price of a meal in these days of H. C. L.; but he is luckier still if, after he has the price, he can get the meal.

What is the function of the draft on a pattern?

Frosh pattern-maker, in all seriousness: To dry the shellac.

The Engineering college has only six men representing it in the fall elections out of forty available positions. What is the matter, Engineers? Surely the only college in the University boasting of having the real "college spirit" should be better represented in student affairs. Lack of material? No! We have as good talent as can be obtained. Lets pull together and get a good representation on the next ticket. Then back the fellows you put up.

Prof. McCaffery and about a dozen mining engineering students attended a meeting of the Wisconsin section of the Mining and Metallurgical Engineers' society on October 29th and 30th, held at Platteville, Wis. On the evening of the 29th, the society attended a dinner at the Columbia Hotel. On the following day an inspection trip was made of the mines, mill and roasters in the southwestern Wisconsin zinc district together with the acid mill at Cuba City, Wis.

Shop 6 men, the tool-makers, capture the "boner" prize this month. When asked what a positive drive on a lathe was, one man "came out" with the following: "A positive drive is one which always turns in the same direction. If it didn't it would be called a negative drive, and the tool would have to be turned up side down."

Another believed through a misundertanding, that an *anvil* was to be turned up on the lathe, and accordingly asked at the tool room for an anvil blue print instead of the regulation end-mill drawing.

The mistake of another is highly justified, for when he wanted a wrench to adjust his compound rest he asked for a "confound" rest wrench.

P-s-s-s, P-s-s-s, p-s-s-s, P-s-s-s. Don't get nervous girls. It isn't a runaway I. C. locomotive on the campus. Its only a plumber, in his new swishy courduroys, steaming up the hill, with the lever in the corner, in a mad effort to make the steam and gas lab.

It will be a grand little thing a couple of years hence to be an engineering student. With the Latin quarter so crowded that you have to take a room on the other side of the square, and the new shops out by the Forest Products Lab., it will be real test of stamina to make a shop eight o'clock.

It just about spoiled the geology trip for the engineers when the girls unloaded at Devils Lake,—silk stockings and everything. We had counted on a pleasant day helping the frails climb up and down the rocks at Ablemans. Nothing but hardship for an engineer.

Just before leaving for the Mixer the other night we were called to the phone by some timid Frosh who wanted to know if "you had to bring a girl to the mixer tonight." We replied in the negative, whereupon he remarked that he'd wasted a perfectly good bath and one white collar getting ready for it, but we think he had a good time anyhow. We did.

Price—"How are you, Walt, pretty hungry?"

Zervas—"Oui! I was out looking for some geology specimens today and I picked up a lot of apatite."

If a dread of water indicates hydrophobia, then the junior engineers who are taking hydraulics ought to wear muzzles.

If fault is found with this issue, blame those Romeos practicing for the Minstrels. Our enthusiasm was prompted by them. Also, if the issue is exceptionally good you will know the reason.

The Standard Laboratory is conducting acceptance tests on sample street lighting transformers intended for the new lighting system at Beloit. These tests are similar to those performed for the city of Milwaukee about two years ago. At that time the characteristics of transformers of this type were investigated quite fully, and the tests resulted in some changes in design of the transformers used.

FOOTBALL

Whether or not Wisconsin is successful in annexing the conference title, every Cardinal supporter knows that the team of nineteen-twenty is one of which he may be proud. Starting with the 60—0 win over Lawrence, the team has been playing a stellar type of football. The game with the Michigan Aggies the next week end showed that Coach Richards had lost no time in bolstering the few weak spots which showed in the Lawrence game. Northwestern, the first Conference opponent of the season, came with a record of a sensational win over Minnesota, but was downed by the Wisconsin warriors. The Ohio game, although a defeat, served to show that Wisconsin has one of the best teams to represent the school that it has had in years. Some consolation may be extracted from Walter Camp's remark when he left the stand just before the fatal forward pass, and while the score was 7—6 in favor of Wisconsin, "Well, the best team won."

To "Big John" Richards goes the great share of the credit for making the team what it has shown itself to be. His loyalty,—and after all, that's the only reason he spends three good months of the year in coaching,—has infused itself in the team. That loyalty and love and admiration for the coach have made the team the fighting organization it is.

The fighting Wisconsin team is captained by "Red" Weston, last year's all Conference end. "Red" has been playing in a form which will merit a high place among the candidates for the all American team. "Scotty" and "Howie" Stark have been playing a great game at tackle, breaking through the line and time and time again nailing the opposing runners for big losses. "Jim" Brader and Margoles have lived up to their names as guards and with Bunge, varsity center, have made the center of the line a stone wall which opposing backfield men have found it almost impossible to pierce. Wisconsin's backfield material this year is far above the average. Davey and Barr alternate at quarterback, both of them equally good at defense and offense. "Rowdy" Elliot is one of the speediest backs in the country, having been mentioned as an all American candidate. "Rollie" Williams and Holmes have also shown themselves players of great ability, Holmes in open field running, and Williams in slipping away through tackle. Sundt, at full, is playing in old time form and has been hitting the opposing line for big gains.

Wisconsin has a team of which it may well be proud, one which comes up to the old Wisconsin standard. If we win or lose the championship, let us all keep up the well deserved praises of Wisconsin's football team of 1920.

And the ENGINEER, along with other things of lesser importance, has changed. As one kind friend remarks, "Getting the Engineer in its new form is just like greeting your bestest when she steps out in a new dress." May we be so personal as to inquire how you greeted your girl—ah, I mean the Engineer?

Professor W. S. Kinne has been appointed Structural Engineer for the University.

J. O. Kammerman, former assistant professor in the partment of electrical engineering, is now teaching at the South Dakota Institute of Mines, Rapids City, S. D.

Elliot Blackwelder, former professor in geology, has resigned his position at the University of Illinois to take up private work in the west in connection with mining interests.

Prof. R. J. Roark has been engaged by the Chicago Bridge and Iron Works to make some tests on elevated water tanks with spherical bottoms, manufactured by that concern. The purpose of the test is to check up some formulas used in designing such tanks. He has already tested one large tank, 24 feet in diameter, and will test others soon.

The youthful instructor in Mechanics 51 was conducting a tension test of mild steel. The class were watching closely; the specimen was nearing failure; the distance between the punch marks, originally one inch, was increasing rapidly.

"Class," he called out as he pointed to the middle of the rod, "this specimen is now about to fail right here where the longest inch is!"

The department of mining and metallurgy has received a donation from the Deister Machine Co., of Fort Wayne, Indiana, of a blat-to slime concentrating table which makes an exceedingly welcome addition to the ore dressing laboratory.

If you have ever tracked the elusive synonym to his lair in the little word book called a "thesaurus," you will appreciate the attempts of harassed seniors to define the word in Engineering Seminar. THESAURUS: "Greek philosophy"; "a biographical writing"; "a mammalian animal who lived during geologic times"; "mythical person in Greek literature"; "a god of ancient mythology"; and, "an instrument for measuring time used before watches or clocks, were in use."

THE OLD ORDER CHANGETH

First it was "Main Hall," then it was "University Hall," and now we come back and find that during the summer some one has painted "Bascom Hall" across the entrance to the noble pile at the top of the hill. Likewise, over the doorway of that red sandstone monstrosity across the campus, in bright new letters, is the word "Law." We can understand "Bascom Hall" for we have heard of Prexy Bascom; but whonell is Law?