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It is with deep regret that we are forced to announce that Doctor C. L. Mees, who was unable to return to active work at the beginning of the term, will in all probabilities not be with us until after the first of the year. The arduous duties connected with the office of president which Dr. Mees held for years have demanded so much of him that he was finally compelled to go into temporary retirement, distasteful as that must be to him, and he asked for and received from the board of managers, a leave of absence for six months.

To say that his absence will be felt, deeply felt, is unnecessary. Dr. Mees, always in sympathy with the undergraduate body, even if that sympathy was sometimes masked under a brusque exterior, has always been appreciated by those who came to him for guidance. The host of friends which he has gathered during the years spent at the Institute is the quiet, convincing proof of the success with which he filled the office of president.

The school although unfortunate in losing Dr. Mees even temporarily, is happily blessed in possessing a man well fitted to step into the breach. Dr. John White will hold the position of acting president during the absence of Dr. Mees. Dr. White has for a long time ably seconded Dr. Mees and is naturally fitted for the position which he is to hold. There is little doubt that under his control Rose shall enter into a year of prosperity and good fortune.

Just about two years ago there appeared in one of our exchanges a clever little parable regarding "a fool who went up in a balloon called education ** and who eventually obtained a Kappa Key, and in the end starved to death." It was thoroughly characteristic of the attitude of the ordinary college man towards "the fellow who works" and was naturally perused with great glee by the majority of those who chanced upon it, and was hailed by them as the very essence of truth.

In contrast with this spirit, which although seldom finding voice in college publications is nevertheless felt to a certain degree in almost every college in this country, is an expression of William Trufant Foster, President of Reed College, Portland, Oregon, which appeared in
September Harper's. President Foster, having apparently made a most exhaustive study of his subject, answers the question, faced by every college man, of "Should students study?" by statistics gathered from a large number of colleges and universities.

For example, he found by a search through the records of the colleges of law and theology of Oxford that the distinction gained by the graduates therefrom varied almost directly with the grades attained during the time spent in school.

He found at the University of Oregon that from the first 24 classes, there were 70 men who had carved out careers which could be termed successful in a large sense. Of these 53 had been good students and 17 had been weak students.

He found that twenty men chosen from an early Harvard class who were acknowledged as successful men were credited with a total of 196 A's while twenty-three men chosen at random had acquired but 56, or practically one-fourth of the number of A's received by the successful men.

These and many other similar figures are given by this college head as an emphatic answer to the question which he, himself, asks. His article should furnish food for thought, and it is to be hoped that it will aid in the banishment of the popular illusion that the honor men are a rather worthless lot outside of the class room.

It is a fact that a student, in an engineering school at least, always has the intention of getting down to real work as soon as he leaves college. It is to be expected, however, as is borne out by collected information that the man who has buckled down to the grind while in college possesses both more ability and greater capacity for work than his less industrious classmates. It has been found that good high school students make good college students, and that poor high school students make poor college students. It is only fair to conclude, therefore, that good college students will develop into good post-graduate students and that poor college students will develop into poor post-graduate students. And who will not admit that every graduate, whether he enroll in a college as a post-graduate or not, must be a post-graduate student?

Autumn again rolls around. It is altogether fitting and proper that as Autumn again rolls around we should make some slight suggestion as to the conduct of Rose students toward those business men of Terre Haute who are supporters of Rose enterprises. It is really with some hesitancy that we enter into such proceedings, for since time immemorial, which to us means 1891, such proceedings have been exceedingly fitting and exceedingly proper, but we regret to say that even clothed in righteousness as they were, they were not usually received in quite the correct and proper manner by the student body of Old Rose.

With age comes tranquility, perspective, and an even temper. Therefore, at the beginning of this, our twenty-sixth year, we feel that we should assume some of the dignities of age, and that it would be altogether unfitting and improper for us to wildly rant on the evil day which shall eventually befall as a result of failure to patronize our ubiquitous advertisers.

We will give vent to our feelings through patriotic explosions of our advertising staff if absolutely necessary; let us hope they will be unnecessary, but beyond that we refuse to go.

In another part of this book you will find a classified list of our advertisers. For the benefit of the Freshmen let it be said that loyal Rose men have the habit of removing this list of advertisers from the book and placing it in a position of honor on the wall alongside of the hour plan, for convenient reference.

Rose students must learn the value of cooperation. In the past The Technic has been fortunate in possessing good advertising men. The merchants of Terre Haute when treated properly have liberally responded. The students of Rose, however, have failed in their duty; they have constituted the missing link.

It is the duty of every Rose man to patronize
Technic advertisers and men who are in sympathy with the activities of the school. It is the duty of every Rose man to remind the merchant he patronizes of the reason that particular merchant happens to be patronized.

We have said enough.

We consider ourselves particularly fortunate in being able to print in this number an article by Professor H. A. Thomas on a series of experiments which he conducted last year in conjunction with Professor Malverd A. Howe. The tests relate to bolted and lag screw joints for timbered structures.

In the past various formulae have been developed from theoretical considerations, but as the nature of the work is quite complex, great difficulty was experienced in attaining definite results, and as might be expected the results which have been obtained by investigators vary considerably, and in some cases even conflict. It was with the idea of developing the problem experimentally instead of from pure theory that the work described was carried out.

It has been the habit of contractors and builders to use less bolts of smaller size than would be called for by engineering design. According to the results obtained by Professor Thomas this is a mistake, and large bolts and plenty of them should be used to develop the full strength of the timbers.

We publish as an Alumni article this month, a contribution from W. B. Kuersteiner, ’10, who is assistant engineer of the bridge department of the Louisville & Nashville Railroad. Mr. Kuersteiner has written on the work in which he is engaged, and has made his article rather untechnical and very interesting.

In this number there appears an article by R. P. Long, ’18, concerning an engineering job on which he was engaged during the summer of 1915. This is the first engineering article written by a Rose undergraduate that has made its appearance in The Technic in years, but we trust that an equal length of time will not elapse before another comes to light. Were it possible we would be glad to publish a series of similar articles written by men in school who have gone into practical work during their summer vacations. Such articles are always welcome.

Mr. Long is to be thanked for his cooperation.

The joint movement by Rose and the State Normal to organize the business men of the city into a joint athletic association for the two schools by means of the sale of tickets good for all athletic events at both schools for one year, has resulted in the sale of about one hundred tickets to date. This is considered a good start, and a heavy sale of tickets should continue, providing the students carry out what has been promised by the athletic management of the two schools. These organizations have promised to give to the city members of this association the support and patronage of their student bodies. They have evolved an elaborate plan for guiding student trade to merchant members. The association members are to be advertised in every possible way.

The idea is a good one. Its success or failure, however, lies with the student bodies of the two schools. Rose men should realize that the plan is a commendable one and should not hesitate to give the Rose Athletic Association the necessary support. Here we have another chance to realize the benefits of co-operation.

Owing to the difficulties encountered in an attempt to publish The Technic on the 20th of each month, a new plan will be in force this year. Hereafter, The Technic will make its appearance on the third Monday of each month. In accordance with the past policy of the journal, the assistance and cooperation of individual students is earnestly solicited. Contributions and suggestions are requested.
The Lateral Bending Resistance of Metal Bolts and Lag Screws in Wood

By H. A. THOMAS, C. E., Professor of Civil Engineering

Many joints and connections used in timber structures depend for their strength upon the resistance of metal bolts or lag-screws imbedded in wood to being bent by transverse loads applied at or near the surface of the wood. Little experimental data appears to be given in textbooks or hand-books regarding the strength of connections of this kind, and theoretical treatments are unsatisfactory on account of the complex interrelation of the bending stresses in the metal of the bolts or lag-screws and the bearing stresses on the fibers of the wood. The tests and studies described in the following summary were recently made at Rose Polytechnic Institute, Terre Haute, Indiana, to determine accurately the resistance of details of this class and to obtain formulas for use in design.

Methods of Testing.

The type of connection experimented upon is shown in Figs 1, 2 and 4. The lag-screws and bolts used were ordinary mild steel commercial stock of sizes varying from 5/8 to 7/8 of an inch in diameter. The woods in which they were imbedded for testing were yellow pine, oak, and white pine. In the majority of the experiments the bolts or lag-screws were free to bend as shown in Fig. 4, with no constraint on the shaft or head. In those tests in which the load was applied by means of a metal plate as in Fig. 1 and 2 the holes in the plate were made a little larger in diameter than the lag-screw shafts, and the lag-screw heads were screwed down to a very loose fit only. This arrangement was adopted in order to make the tests conform as nearly as possible to conditions in practice, where the irregularity of the shafts prevents a close fit in the holes of the connection plate, and the initial tension on the heads is often entirely released by the shrinkage of the timber in seasoning.

Most of the tests were not carried to final failure. In the connections on which a complete test was made, the failure was found to occur in five stages. These are illustrated in Fig. 3, which is the load-deflection curve from the test on the joint shown in Fig. 1 and represented diagramatically in Fig. 2. During the first stage, ab in Fig. 3, the load concentrates itself at point A, Fig. 2, and the bolt beds itself firmly in the bolt-hole if the initial fit is imperfect. During the second stage the increasing load is carried by the elastic resistance of the wood fibers at D and the metal...
THE ROSE TECHNIC.

FIG. 2. LAG-SCREW WITH TRANSVERSE LOAD

FIG. 4. DEVICE FOR MEASURING DEFLECTIONS

FIG. 3. LOAD-DEFORMATION CURVE FROM TEST OF THE CONNECTION SHOWN IN FIG. 1.

TABLE I. SAFE TRANSVERSE LOADS IN POUNDS FOR MILD STEEL BOLTS OR LAG-SCREWS. COMPUTED FROM EQUATION 8, WITH E = 16000.

<table>
<thead>
<tr>
<th>Wood</th>
<th>End bearing</th>
<th>Diameter of bolt or lag-screw, inches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Oak, Southern Long-</td>
<td>1 1/4</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Leaf or Georgia Yellow Pine</td>
<td>1 1/2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Spruce, Eastern Fir, Douglas, Oregon, and Yellow Fir</td>
<td>1 3/4</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>White Pine, Northern or Short-leaf Yellow Pine, Cedar, Hemlock</td>
<td>2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Red Pine, Norway Pine, Cypress</td>
<td>2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
</tbody>
</table>

TABLE II. SAFE TRANSVERSE LOADS IN POUNDS FOR WROUGHT IRON BOLTS OR LAG-SCREWS. COMPUTED FROM EQUATION 8, WITH E = 12000.

<table>
<thead>
<tr>
<th>Wood</th>
<th>End bearing</th>
<th>Diameter of bolt or lag-screw, inches.</th>
</tr>
</thead>
<tbody>
<tr>
<td>White Oak, Southern Long-</td>
<td>1 1/4</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Leaf or Georgia Yellow Pine</td>
<td>1 1/2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Spruce, Eastern Fir, Douglas, Oregon, and Yellow Fir</td>
<td>1 3/4</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>White Pine, Northern or Short-leaf Yellow Pine, Cedar, Hemlock</td>
<td>2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
<tr>
<td>Red Pine, Norway Pine, Cypress</td>
<td>2</td>
<td>3, 4, 5, 6, 7, 8, 9, 10, 11, 12</td>
</tr>
</tbody>
</table>

FIG. 6. COMPARISON OF TENSILE AND CROSS-BENDING TEST CURVES FOR 7/8 INCH MILD STEEL BOLTS.
at E. The load-deflection curve is approximately straight during this portion of the test. This stage is terminated at the "yield point" c by the simultaneous yielding of the wood fibers at D and the metal fibers at E. During the third stage the deflection continues to increase with little or no change in the load. At the beginning of the fourth stage de the bolt makes contact at B or C. The load again increases during this stage up to the beginning of the final failure at e. The last stage ef represents the splitting of the wood or the parting or pulling out of the bolts or lag-screws.

The large deflection at the ultimate load—more than \( \frac{1}{4} \) inch in Fig. 3—and the uncertainty and irregularity in the value of the ultimate load on account of the various possible kinds of failure make it very desirable to keep the safe allowable working loads well below the yield point c, in the design of connections depending for their strength on the bending of bolts or lag-screws against wood fibers. For this reason the greater part of the experiments of this series were arranged for the accurate determination of the yield point only, and the loads were purposely applied in such a way as to exclude the effects of friction or the confining of the bolt head or shaft by a connection plate.

The apparatus used in carrying out these tests was designed by Professor M. A. Howe. The loads were applied and measured by a testing machine of 30,000 lbs. capacity. The deflection measuring device was fastened firmly against the specimens with wood screws, as shown in Fig. 4. To indicate the instant of contact between the micrometer screw and the deflection lever a small electric light bulb with dry battery was used. This was found to be more delicate, convenient, and reliable than the electric buzzers commonly used for this purpose. In making the tests the micrometer was set to give increments of deflection of .005 inch and the loads were applied slowly, the flashing of the light indicating when the desired deflections were attained.

The readings from each test were plotted as a load-deflection curve, on which the yield point was determined by inspection as the point of greatest rate of change in the slope of the curve.

The specimens of wood used in these experiments were tested in end bearing against both plane and cylindrical metal surfaces, with the aid of a deflection apparatus which was described in Engineering News, May 7th, 1914, in order to determine the yield points of the fibers in end bearing against square and round bolts. Cross-bending and tensile tests were made with the regular laboratory equipment to determine the yield points of the metal used in the bolts and lag-screws.

ANALYSIS AND RESULTS OF TESTS.

In removing the bent bolts and lag-screws from the wood after testing, it was noticed that the bend, point E in Fig. 2, was in every case quite abrupt and not a gradual curve. The straightness of the bolts between the bend and the surface of the wood suggested the possibility of writing algebraic expressions for the resistance of the bolts to bending against the wood fibers, on the assumption of a straight line distribution of the stress on the wood fibers between points E and D in Fig. 2. These expressions were worked out as follows.

Let \( d \) be the diameter of the bolt in inches; \( a \) the distance in from the surface of the wood to the point of maximum bending, inches; \( w \) the load carried by the bolt at the instant of yielding, pounds; \( f \) the fiber stress in the metal of the bolt at its yield point in cross bending, pounds per square inch; \( p \) the yield point bearing stress of the wood fibers, pounds per square inch; \( n \) the ratio of the yield point resistance of wood fibers in bearing against the side of a round metal bar to their resistance in bearing against a square metal bar of the same diameter and length. When the load \( w \) is applied to the bolt, the fiber stresses in the wood distribute themselves according to some such curve as that indicated by the dotted line in Fig. 2. If the imbedded length of the bolt is large in comparison with its diameter, the
stresses represented by the dotted line on the upper side of the bolt will be very small. If they are neglected, the load \( w \) will equal the total pressure exerted by the wood on the under side of the bolt. At the instant of yielding, the deflection of the bolts at the surface of the wood was found from the tests to have about the same value as the yield point indentation of the wood fibers in common end bearing tests. The yielding of the bolt thus occurs when the fibers at the surface of the wood directly under the bolt reach their yield point stress \( p \). Assuming a straight line distribution of the fiber stresses, for reasons given above, the following expressions are obtained. The sum of the vertical forces acting on the bolt is zero, or

\[
W = \frac{1}{3} \eta \pi d^3 1.
\]

The point of maximum bending is where the shear is zero, at the inner end of the stress triangle, and the bending moment at this point is

\[
M = w a - \left( \frac{1}{3} \eta \pi d^3 \right) \left( \frac{3}{4} a \right) = \frac{3}{4} \pi d^3 2.
\]

Solving these equations for \( w \) gives

\[
W = \frac{1}{3} d^2 \sqrt{3 \pi n \eta f} 3.
\]

A comparison of values obtained by this analysis with the results of experiments is given by the nine load-deflection curves from the tests, shown in Fig. 5. The short horizontal lines on these curves represent the yield loads, \( w \), as computed by equation 3 of the preceding paragraph. In substituting in this equation, \( f \) was taken as 69300, 70500, and 72900 lbs. per square inch for the \( \frac{7}{8} \), \( \frac{5}{8} \), and \( \frac{3}{8} \)" bolts respectively, and \( n \eta \) was taken as 6000, 7500, and 4400 lbs. per square inch for the tests using yellow pine, oak, and white pine respectively. These values were determined by separate tests as mentioned above. The curves of Fig. 5 bring out the close agreement between the actual and computed yield points, and illustrate the accuracy of equation 3 for computing the resistance of bolts loaded under conditions similar to those of this series of tests.

**Working Formulas.**

In order to adapt equation 3 to the use of the common safe allowable fiber stresses in wood and steel, it is desirable to make a change in its form. The usual allowable fiber stresses for metal, as for example 16000 lbs. per square inch, give a certain safety factor on the yield point of the material in tension. Considering the yield point as the stress intensity at which a specimen yields under little or no increase of load, its value for mild steel bolts in cross-bending was found in this series of tests to be about 170% of its value for the same kind of bolts in tension. For this reason if the ordinary safe allowable fiber stresses for metal and wood are substituted in equation 3 to obtain safe working loads for the design of connections, an unnecessarily large safety factor will be secured. To obtain a working formula free from this objection, the following transformation was made.

Figure 6 shows the moment-deflection curve from the test of a \( \frac{7}{8} \) inch round mild steel bolt in cross-bending, and the stress-strain curve from the test of a similar bolt in tension. In a cross-bending test of a round bolt, the true proportional elastic limit will occur when the distribution of the stress on the governing section of the bolt is as shown by the straight line \( \text{aoa}' \) in Figure 7. At this instant the stress in the extreme fiber is equal to the tensile elastic limit \( e \) of the metal. When the loading has been increased until the distribution of stress approaches curve \( \text{abob}'a' \) the bolt will deflect under a constant load; that is: the yield point of the material in cross bending will be reached. In the first case the resisting moment of the bolt is computed by

\[
M_a = e \frac{\pi d^3}{32} 4.
\]

In the second case the resisting moment is computed by

\[
M_r = e \frac{\pi d^3}{32} = 4e \int_0^r + \sqrt{r^2 - x^2} \, dx = \frac{4}{3} e r^3 = \frac{e d^3}{6} 5.
\]

Solving,

\[
\frac{f}{e} = 16 = 1.696 6.
\]
That is: the yield point in cross bending is 170% higher than the yield point in tension. Substituting in equation 3 the value of \( f \) from equation 6, we obtain

\[
W = 0.500 \, n \, d^2 \, \sqrt{\frac{p_e}{f}}.
\]

This equation gives the yield point load carried by the bolt, in terms of the end bearing yield point of the wood fibers and the tensile yield point of the steel.

In order to make use of equation 3 or 7 in practice it is necessary to know the value of \( n \), that is: the ratio of the bearing resistance of wood against round pins to its resistance against square pins. A considerable number of tests were made to determine the value of this ratio. The values of \( n \) were found to be rather erratic, apparently depending much on the friction of the wood fibers against the round pins, and being affected by the roughness of the pin, pitch or moisture in the wood, and the method of boring the hole. The average value of \( n \) in end bearing on the wood fibers from more than sixty tests was found to be .75. This value is used in equation 8. To adapt equation 7 to the use of working stresses, let \( W \) be the safe load allowed on a bolt or lag-screw bending against wood fibers, \( P \) the safe allowable bearing stress on wood fibers, and \( E \) the safe allowable tensile stress for metal. The final working equation for the design of bolted or lag-screw timber connections may then be written

\[
W = 433 \, d^2 \, \sqrt{PE}.
\]

This equation should be used only for lag-screws or bolts of circular cross section, of metal having a well defined yield point, and bearing endwise against the wood fibers.

Tables I and II have been computed from equation 8, using the safe allowable end bearing fiber for wood recommended by the Committee on “Strength of Bridge and Trestle Timbers,” Association of Railway Superintendents of Bridges and Buildings, Fifth Annual Convention, 1895, and modified in 1904. The values given in these tables will be found to be somewhat lower than those given in a short table in Kidder’s Architects’ Handbook.

The derivation of the preceding formulas is based on the condition that the imbedded length of the bolts or lag-screws is large in comparison with their diameter. Some of the tests made show that when the distance in from the surface of the wood to the beginning of the threads of a lag-screw is two diameters, or even a little less, the yield point checks very closely with the value computed by equation 3. For lag-screws with a greater length of imbedded shaft than this, the yield point appears to be independent of the length.

It would seem that the method of deriving equations 3, 7, and 8, might be applied with a reasonable assurance of accuracy to cases slightly different from those covered in the tests. For the case where the bolts or lag-screws are bent against the sides of the wood fibers instead of the ends, the ratio \( n \) would have a value of about unity and the numerical coefficient in equation 8 would become .500 instead of .433. For the case of a square bolt of diameter \( d \), bearing against either the ends or the sides of the wood fibers, the substitution of the section modulus for a square in the last member of equation 2 leads to a value of .652 for the coefficient in equation 8. If the transverse load is not applied to a lag-screw or bolt at a point flush with the surface of the wood but at a distance \( m \) from that surface, the method used in deriving equations 3, 7, and 8 gives

\[
W = \frac{1}{3}d^3 \left( \sqrt{3npf} + (6mnp)^2 - 6mnp \right) 3a.
\]

\[
W = 0.500 \, n \, d^2 \left( \sqrt{pe} + (1.50mnp)^2 - 1.50mnp \right) 7a.
\]

\[
W = 433 \, d^2 \left( \sqrt{PE} + (1.30mP)^2 - 1.30mP \right) 8a.
\]

The modification of these formulas to apply to square bolts or lag-screws bearing against the sides of the wood fibers may be readily made if desired.

The tests and studies described above were undertaken at the suggestion of Professor Malverd A. Howe. The experimental work and reduction of data were done by the writer.
The Pennsylvania Railroad Subway at Fort Wayne, Ind.

By R. P. Long, '18

This subway is typical of the structure built by the Pennsylvania R. R. in executing grade separation both in cities and at public road intersections. It was built under the Pennsylvania tracks where they are intersected by Pontiac street and Wayne Trace highway, both of which roadways are now diverted through the subway. The point of intersection of the railroad and of the roadways mentioned above is almost midway between the ladder tracks of the westward receiving and the westward classification yards, which are connected by a single track about 170 ft. long. The freight yards of the G. R. and I. Ry. are just on the opposite side of the main tracks. The situation is shown in Fig. 1. The constant switching of cars and blockading of the crossing caused great inconvenience to the steadily increasing number of people who used it.

Projects for abolishing the crossing difficulty were discussed for some time but no definite action was taken until January, 1914, when a petition for grade separation was presented to the Indiana State Utilities Commission. Two hearings were held, the final one being at Indianapolis in April, 1914. In September, 1914, an order was received by the Pennsylvania Company ordering the construction of a subway with its completion not later than Jan. 1, 1916.

Accordingly the railroad company set about taking initial steps toward the construction of the subway to comply with the order of the commission. It was agreed that owing to the fact that the city limits almost bisected the location of the proposed subway, complicating the matter of payment by railroad; city and county, that the corporate line should be changed to a new location west of the site, throwing all the work in the county. Twenty-five per cent of the cost of the work was to be paid by the county, and after completion of the job, the line was to be restored to its former location. This left but two parties interested during construction.

Owing to the fact that the tracks were from four to twelve feet higher than the roadway, the only feasible type of construction was that of a subway for the roadways under the tracks. It was desired to depress the roadways as much as possible to avoid heavy grades in the tracks. The amount of depression possible was dependent, however, on the question of drainage. There being no sewers in the vicinity, the only possible method of drainage was to lay a tile line from the subway to a small creek that flows under the tracks through

North End of Subway

South End of Subway
a culvert about 200 ft. west of the site. A profile of the creek was taken and from these notes the lowest elevation of the roadway was established. In order to secure a greater fall the outlet of the tile drain was placed down stream, where the creek touches Fenken ave. A raise of four feet was then required in the tracks at the subway to make possible a 12'-6" clearence. The tracks are level across the subway and .38% grades are established on each side.

Having established the roadway elevations and grades it was found that if the Pontiac St. approach on the north side were to be started at its intersection with the C. F. & Ft. W. Ry., single track, its grade would be so steep as to be prohibitive. To get around this difficulty the C. F. & Ft. W. Ry. had to be relocated. The dotted line in Fig. 1, shows the old location and the solid line the new. The new location begins at a point about 900 ft. east of the subway. By means of two 10° curves separated by 300 ft. of tangent track the line was swung to a new location parallel to and 160 ft. north of the Pennsylvania main tracks. A 10° curve was compounded with a 2° curve where the new line intersected the old. This permitted placing the approach at the desired 3% grade. The elevation of the approach where it intersected the new line gave the elevation of the C. F. & Ft. W. Ry. at that point and from this its new grade was figured.

**MASONRY.**

A cross section of the subway is shown in Fig. 2.

The abutments are 103 ft. long with wing walls 16 ft. 6 in. long on either end and have the section shown in Fig 2-A. Copings are placed at both ends of the subway. A roadway of 50 ft. is provided. Expansion joints are placed in the abutments every 25 ft. 9 in., bulkheads being built in the forms and the sections poured alternately. This insured each section being filled at one continuous pouring,
First Column in place, South Side.
Subway Excavation, South Side.
View of North Side, Showing Temporary Trestles.
Excavation for Subway, North Side.

Distributing Chutes on Platform.
Wayne Trace Approach, South Side.
View of North Side, Showing Steel in Place.
thus avoiding the liability of horizontal cracks due to uneven setting of the concrete. At each expansion joint, three pieces of old 85 lb. rail about 4 ft. long were placed with half their length in each of two abutting sections of wall. Weep holes were provided every 15 ft. along the wall at the elevation of the side of the roadway to drain the back fill. An elevation of the abutment is shown in Fig. 2-B and a plan in Fig. 2-C. The piers, of which there are eight, supporting the center columns are shown in Fig. 2-D.

STEEL SUB AND SUPER-STRUCTURE.

The steel work was made by the Riter-Conley Co., and is of the solid floor type. The floor was designed for a dead load equal to the actual weight of the steel plus 400 lbs. per lin. foot of track. The live load was assumed as 5,500 lbs. per lin. foot plus 66,000 lbs. concentrated, distributed over 9 ft. 0 in. width. The assumed loading for the columns was a dead load of 450 lbs. per sq. ft. plus weight of cross-girder plus weight of column given. Live load as above with three tracks loaded and with center line of track over center line of column. The floor is made up of troughs and is in two twenty-five foot spans. One end of the span rests on the girders supported by the columns and the other on the abutments. Sheet lead is placed between the column bases and the grillage in the piers. Sketches of portions of the steel and of the method of waterproofing are shown in Figs. 3, 4 and 5.

APPROACHES.

The approaches descend into the subway on 3% grades and are of concrete. They are concreted to a depth of 8 inches at the sides and 10 inches in the center and are provided with transverse expansion joints. On each side are placed 5 ft. earth shoulders and 6 ft. ditches. A 1:2:3 mix was used in concreting the approaches.

CONSTRUCTION.

Actual work was started on April 1, 1915, at which time the forces of the R. R. Co. commenced raising the tracks on cinders and Gary sand. In twenty days a pile driver was started placing piling for temporary trestles under each track. These preliminary jobs were practically complete by May 21, when the contract was let to the Rust Engineering Co. of Pittsburgh. Their bid was based on the following estimated quantities:

Subway excavation........ 5070 cu. yds.
Subway Masonry ........... 1443 cu. yds.
Approach grading ........... 10000 cu. yds.
Approach paving .......... 2200 sq. yds.
Drain tile in place ....... 570 lin. ft.

The plant erected for the execution of this work is shown in the accompanying illustrations. It consisted of a 60 ft. Lakewood distributing tower, a 2-3 yards Ransome mixer and a hoisting engine. A Thor steam shovel did the bulk of the excavation work. In spite of a most discouraging series of rainy periods the job was practically completed by Nov. 1, 1915, although its opening did not occur until Jan. 1, 1916.
The Maintenance of Railroad Bridges and Trestles

By W. B. Kuersteiner, ’10
Assistant Engineer, Bridge Department, Louisville & Nashville Railroad

HOW does a railroad of about five thousand miles of line maintain its steel and iron bridges, over eight hundred in number, each of one to thirty spans, and its hundreds of wooden trestles aggregating in length over sixty miles? What is the life of a railroad bridge? On what does its life depend? What is the life of a wooden trestle and on what does its life depend? These are some of the questions the writer would like to discuss in this paper.

At the start a brief outline of the railroad’s engineering force would not be amiss. For the purpose of operation the larger railroads are divided into “Divisions,” each of about two hundred to three hundred miles of line. Each “Division” is under a separate management. The “Division” engineering forces consist of a bridge supervisor and his crew who look after the bridges and buildings on the division, a road-master and his men who maintain the roadbed and tracks, an assistant engineer who makes all surveys and keeps the track in proper alignment, and a signal maintainer.

The engineering forces of the main office are under the direct charge of the chief engineer of the railroad, who also has indirect charge of the division engineering forces. The chief engineer’s office is divided into several departments, each having a special line of engineering work to do. The construction department of his office deals exclusively with the construction of new railroad lines; the bridge department supervises the construction of all bridges, trestles and culverts on the system; the architectural department looks after all stations, shops and other buildings; the signal department supervises the installation and maintenance of the signal systems. There are, on some roads, other departments that design new railroad yards and do other special work.

In this paper, we will confine ourselves to the maintenance of the bridges and trestles.

To keep informed as to the physical condition of the bridges and trestles, every structure is inspected about every two weeks by a division foreman, every three months by the division bridge supervisor and every six months by the bridge inspector from the chief engineer’s office. The results of these inspections are reported to the chief engineer for his information and record.

The life and safety of a railroad bridge depends on its physical condition and on its theoretical strength. The structures shall be treated under the following heads—meta
bridges, wooden trestles, concrete structures. We will first deal with the physical condition of the structures, briefly stating what the inspection of the structure consists of, what some of the usual “failures” and repairs are, and what length of life the structure usually has. We will then deal with theoretical strength and show what effect it has on the life of the structure.

The usual inspection of a metal bridge, a truss span or a girder span, consists of the examination of the masonry, the condition of the paint, the wooden floor and the bridge details.

The masonry, if built of concrete and properly designed, will usually not give any trouble unless perchance it was placed on a poor foundation or is undermined by the stream. However, quite often, trouble is experienced with the old stone masonry abutments and piers. One of the common troubles with this old masonry is the disintegration of the stone from weathering. Another is the disintegration of the stones immediately under the bridge bearings due to the continuous pounding of the fast-moving trains passing over the bridge. It is often necessary to remove disintegrated stones of old masonry. To prevent the pounding mentioned above, some railroads have adopted the practice of placing creosoted timbers twelve to fifteen inches deep under the bearings of all bridge spans less than about one hundred and fifty feet in length. The timbers act as a cushion, protecting the masonry and at the same time making the trains ride easier. These timbers are not used under large spans because the bridge bearings become too large, due to the smaller allowable bearing on timber as compared with masonry. Also because on large spans, this pounding effect is not so bad as on the small spans.

Undermining of old masonry abutments and piers occasionally occurs on account of the shallow foundations used in former years and, sometimes, because of a change in the stream. This undermining is often stopped by placing several car loads of rip-rap (broken stone) around the masonry.

The prevention of the oxidation or rusting of steel and iron bridges is one of the difficult problems confronting the bridge engineer. Paint is a temporary preservative; a coat of concrete properly applied is believed to be a permanent preservative but the problem is yet to be solved. The frequency with which bridges must be painted depends greatly on the location of the structure, the climatic conditions, etc. A fair average would be four or five years for steel bridges and six or seven years for iron ones. Considerable trouble results from the brine that drops from refrigeration cars to the top of the stringers and girders, particularly those in terminals.

The average life of green sawed timber ties on bridges is about eight or nine years. These ties are usually replaced on account of the wear under the rail; this in spite of the fact that tie plates are used. The ties on the road bed (green hewn ties) usually rot out before they wear out and have an average life of seven years. Tie plates are, as a rule, not used on these ties. On account of the constant increase in cost of ties many roads are using treated road ties. Most of these roads, however, still use the green ties on the bridges because rail wear and not rot determines the length of their life. The relatively rigid support under the bridge tie as compared with the yielding roadbed under the road tie explains why the former should wear out faster under the rail than the latter.

The inspection of the bridge details consists of the examination of the connections and general physical condition of the span. One of the most common troubles with the older bridges is from the weak lateral systems. This is the bracing that is often termed the “wind bracing” but this term is a misnomer as it is really the swaying of the locomotive and train that strains this system most. This is particularly true at the present day when the engines are so heavy and the trains are so long. It is usually practical to strengthen these lateral systems. A common trouble with old pin truss spans is pin wear. The pins usually
giving the trouble are the top pins of the center diagonals, which have a reversal in stress every time a train crosses the bridge. Pin wear is usually difficult to repair and occasionally necessitates the removal of the bridge.

Very few bridges are rebuilt because of the rusting of the metal, a small per cent are rebuilt because of weak details and the majority are rebuilt because they are too weak to carry the heavy trains that it is desired to run over them. This is determined by their theoretical strength. The theoretical strength of every structure is known to the chief engineer. No train is allowed to pass over a bridge unless it is known that, in accordance with the best engineering practice, the bridge is strong enough to carry the load.

It should be explained that when new bridges are designed, unit stresses somewhat lower than the highest recognized safe unit stresses are used. Also, these bridges are designed for specification engines heavier than any engines actually in operation on the road. These bridges are therefore capable of safely carrying engines and trains much heavier than the those in operation at the time when the bridge was built. It is on this account that the bridges built about twenty-five years ago are in some cases capable of carrying the heavy engines of today. The policy of today is to use heavy engines and long trains instead of dividing up the trains and using lighter engines. As the weights of the engines increase the older bridges must be rebuilt or strengthened. (It is only occasionally that it is found economical to strengthen an old metal bridge). Having determined the theoretical strength of the structures on a line, the chief engineer informs the division forces what weight engine will be allowed on that line. If the business on the line demands longer trains and heavier engines and the business is sufficient to warrant rebuilding or strengthening the weak bridges, the reconstruction is made and the heavier engines are allowed to pass over the line. Thus on the railroad system there are lines where only light engines are allowed and others where the heaviest in operation are allowed.

Wooden trestles are built of green and creosoted timber. The decks are either open decks or ballasted; the bents are either frame or pile. The older trestles are mostly green open deck trestles. The life of a green trestle varies considerably, a fair average being eight to ten years. The usual inspection of a green trestle includes the examination of the general condition of the structure for signs of failure or rot, and an examination of the galvanized or sheet iron used for fire protection. The condition of the trestle is most carefully watched after it is about seven years old at which time it begins to need repairs. These repairs are usually light enough to warrant having them made so that the trestle can be used one or two years longer.

For economical reasons and because of the ever increasing scarcity of timber, many railroads are using creosoted timber for their new trestles. The life of a creosoted trestle is arbitrarily placed at about twenty-four years for estimating purposes but as far as the physical condition is concerned its life is of indefinite length. The creosoted ballasted deck trestle is now the standard trestle on many roads. This type of trestle has many advantages over the green open deck trestle, notably a longer life, little or no maintenance, a continuous ballasted roadbed over the structure, making the riding easier, and little or no danger on account of fire. These advantages are of great moment, as they cut down the cost of maintaining the railroad's trestles considerably.

What was said about the theoretical strength of the metal bridges applies also to the wooden trestles, except that the theoretical strength, as a rule, does not limit the life of the open deck trestle. This is due to the fact that open deck trestles can easily be strengthened for the heavy engines by placing additional stringers in the deck. In the case of the ballasted-deck trestle it is difficult to strengthen for heavier engines, and it is possible that the theoretical strength
THE ROSE TECHNIC.

will limit the life of the structure to about twenty-four years.

Concerning the concrete structures it should be said that if properly designed and constructed these structures, viaducts, arches, culverts, etc., are generally believed to have an indefinite life. On this account and on account of the fact that the maintenance cost of a concrete structure is practically naught, concrete is gradually replacing steel and wood as the building material for certain classes of railroad structures.

The above is, in substance, the plan of maintaining bridges and trestles used by the railroad for which the writer is working. On other roads there may be certain deviations from this plan but the general scheme is practically the same for all roads.

LOCATION OF JUNE GRADUATES

John C. Barrett, Adamson Machine Co., 155 Park St., Akron, O.
George W. Brooks, Public Service Co. of Northern Illinois, Waukegan, Ill.
J. Paul Brown, Falls Machine Co., Cheboygan Falls, Wis.
Clarence F. Carlisle, King Bridge Co., 2272 E. 84th St., Cleveland, O.
F. Guy Coates, Engineer Corps, Pennsylvania Lines, Union Station, Indianapolis, Ind.
James A. Dailey, General Electric Co., Schenectady, N. Y.
Clarence L. Davison, General Electric Co., Schenectady, N. Y.
Glen W. Evans, General Electric Co., Schenectady, N. Y.
Ralph E. Finley, Vandalia R. R. Co., Vandalia, Ind.
Edwin S. Flarsheim, General Electric Co., Schenectady, N. Y.
Elmer Gadberry, Firestone Tire & Rubber Co., 708 Blaine Ave., Akron, O.
F. Carr Goldsmith, Terre Haute.
David W. Hite, Toledo Railways & Light Co., Toledo, O.
David W. Holloway, Pennsylvania Line, Cleveland, O.
Oscar P. Hutchinson, Nordsyle & Marmon Co., 823 N. Capitol Ave., Indianapolis, Ind.
Roy I. Kattman, Vandalia R. R., Terre Haute, Ind.
Frank J. Kline, Bowman Electric Light & Power Co., Marmarth, N. Dak.
Robert B. Larr, Fairbanks, Morse & Co., Indianapolis, Ind.
Sidney C. Leibing, General Electric Co., Schenectady, N. Y.
Robert F. Leinberger, General Electric Co., Schenectady, N. Y.
Morris J. McKeever, Diamond Match Co., Oswego, N. Y.
George Maier, Jr., Sales Dept. American Radiator Co., Chicago, Ill.
Mahlon E. Manson, Armour & Co., 6361 University Ave., Chicago, Ill.
Allen D. Merrill, Indianapolis, Ind.
Howard J. O'Laughlin, City Engineer's Office, Terre Haute.
H. Eugene Smock, General Electric Co., Schenectady, N. Y.
Warren R. Spencer, Instructor R. P. I.,
Terre Haute.
Roscoe R. Stoltz, Westinghouse Elec. &
Sam P. Stone, with Sam Stone, Jr., Ar-
chitect, New Orleans.
Ralph A. Stuart, Western Elec. Co., 876
Putnam Ave., Detroit, Mich.

Ray Trimble, Engineer Corps Pennsylvania
R. R., Fort Wayne, Ind.
F. Casper Wagner, Gen. Elec. Co., Schenec-
tady, N. Y.
Robert A. Weinhardt, Pennsylvania R. R.
Co., Pittsburgh, Pa.
Verne L. Whitacre, Commercial Distillery
Co., Terre Haute.

NOTES

Earl E. Hughes, '13, made a short visit to
the Institute on Sept. 25.

David W. Holloway, '16, spent several days
during the early part of September with his
parents in Terre Haute.

Ralph A. Stuart, '16, formerly at Haw-
thorne, Ill., with the Western Electric Co., has
been sent to Detroit where that company is
installing a new exchange.

William Motz, '16, was married on June 6
to Miss Zella Fox, of Terre Haute.

Robert B. Larr, '16, was married to Miss
Geneva Smock of Terre Haute on June 12.

Joseph H. Carter, '16, was married to Miss
Clare Rae of Terre Haute on June 10.

Albert Lyon was married on June 7 to Miss
Bertha Phillips of Terre Haute.

Wayne K. Self, '17, was married June 22 to
Miss Jessie Painter of Terre Haute.

Frank O'Laughlin, '14, was married to Miss
Bessie Dailey of Terre Haute, Monday, Sept.
26, 1916.

Norvin E. Compton, '15, was awarded the
Fellowship designated to Rose students by
Columbia University, on his scholastic stand-
ing at Rose and a recommendation from Dr.
Mees. This Fellowship is for one year in the
six year course for the degree of Ch. E. in
the School of Mines and Engineering, and
carries with it $250. For his work at Rose,
Compton was to receive 4½ years credit,
necessitating his remaining at Columbia two
years. In preference to doing this, he resigned
the Fellowship and registered in a one year
course for the degree of M. S. in Ch. E.

His address at present is Livingston Hall.

George F. Nicholson, '06, was appointed
July 1, 1916, to succeed J. R. Werst as Chief
Engineer of the Port of Seattle, where im-
provements totaling $6,300,000, are being made
in the way of docks, warehouses and cold
storage plants, and are under his direction.
Mr. Nicholson is married and his wife form-
erly was Miss Fayelle Fisbeck of Terre Haute.

Announcement has been received of the mar-
rriage of Miss Ruth Strongman of Brookline,
Mass., to F. E. Bundy, '15.

Mrs. Annette Eaton announces the marriage
of her daughter, Florence Velda, to John C.
Barrett, '16, Friday, October the sixth. The
marriage took place at Cleveland, Ohio, and
Mr. and Mrs. Barrett are to take up residence
in Akron, Ohio, where Mr. Barrett is located
with the Adamson Machine Co.

George G. Anderson, '16, was in Terre
Haute Sept. 29, on a short business trip.

Barton R. Shover, '90, visited the Institute
Thursday, Sept. 6. Mr. Shover has just re-
turned from India, where he was sent by the
British Government in connection with the
government steel works in that country.
THE SCRAP.

The annual battles for supremacy between the two lower classes were almost farcical this year. Upper classmen who saw the "Tie-up" and "Pipe Rush" had a most disgusted expression on their faces as they recalled the fierce onslaughts of their opponents in days gone by, the scraps that raged for hours, and the piles of flying arms and legs about the big pipe.

The above is from the viewpoint of a spectator. One the other hand there occurred several lively skirmishes which bore all the earmarks of honest argument.

On Wednesday evening a number of luckless Freshmen were kidnapped and carted into the wilds south of the city. The Freshmen were out in force, however, but the best they could do was to capture little Werbner. Through some unknown channel they received word that some of their numbers had fallen into the hands of the enemy and that they had been left some place near Spring Hill. They immediately hired a few Fords and started for the country. It seems as if a complete plan had been devised by the Sophomores, however, for when the Freshmen left the machines at Spring Hill the drivers immediately beat a hasty retreat and left the new men to walk back to the city. Most of these men walked over to the Sullivan interurban line and came back to town on the eleven o'clock car.

At about 10:45 a few Freshmen appeared at the corner of Seventh and Wabash, and only a little later a machine crowded with bloodthirsty Sophomores put in an abrupt appearance. The Freshmen immediately beat a retreat up the alley south of Wabash hotly pursued by the avenging Sophs and for a time the skirmish proved rather warm. Fortunately for the Freshmen, however, the Sullivan car arrived at this time and aided by their reinforcements they were able to overpower those Sophomores who were courageous enough to remain and see things through. Most of the upper-classmen made their escape in their machine, which was pursued several blocks down Wabash Avenue by the swarm of Freshmen.

Thursday evening brought its own excitement. The Sophs knowing they could never hope to overpower the first year class by brute force decided to out-Hindenburg them. They planned to assemble at the meeting place of the Freshmen and to gather them in as they came. This plan would have worked beautifully, but for the fact that so many Sophomores were required to act as draymen in transporting the enchained Freshmen to a place of safety that they were seriously crippled, and when a party of Freshmen football players put in an appearance, arriving from football practice, they were outnumbered and most of them were unable to escape.

As a result only seventeen Sophs were on hand to guard the challenge, and when two dray loads of triumphant Freshmen arrived on the scene of action, the music was very short and very sweet.

It took but a half hour for the Freshmen to overpower their remaining foes and to load them on the drays which they had thoughtfully brought with them, and at just nine o'clock the teams started for the country.

Some barber's clippers were produced during the evening's entertainment, and several beautiful Sophomoric pompadours were recklessly mutilated. This last action in the opinion of several was rather uncalled for since the victors possessed such overwhelming num-
bers, and the upper-classmen did not really possess even a fighting chance.

The first pipe fight on Saturday was an absolute fizzle. The less said about it the better. The big pipe rush, however, took a novel turn which might well be mentioned. Just as Hath projected the pipe of contention at a velocity of \( V \) feet per second out onto the battle ground, John Piety dashed for it from the east side of the field. He reached it and hurled it recklessly over the crowd in the direction of the tennis courts. Here it was seized by Bill Bruning who elongated himself in the direction of the gate and handed the pipe to Barnes, who was waiting in an automobile.

By this time the Freshmen had reached and mounted the Thirteenth street fence, only to see the coveted pipe triumphantly borne away.

Thus ended the interclass disputes for this year; honor and glory about 50-50.

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The freshmen

The Freshman Class comes to the front with an enrollment of ninety-nine, an increase of seventy-eight per cent over that of last year. The class roll follows:

WHO DID IT?

On the night of September 27, the sacred and time-honored portals of the Main Building were violently broken open by a gang of ruffians of the most desperate character. Not content with this act of sacrilege, these vandals left in their wake a series of placards bearing the peremptory command, “Beat Wabash!” As yet the culprits have not been brought to justice; in fact, the identity of the bold invaders is quite a mystery. The Student Council, the Athletic Association, and even Coach Mefford, as well as the football manager were regarded with suspicion. It is hardly likely that any individuals would take it upon themselves to offer such excellent advice to the school at large, yet no organization can be found guilty. It seems as if the event is to be one which shall go down in the pages of history as an unsolved mystery.

Y. M. C. A. MEETING.

A meeting of the Y. M. C. A. was held at the Heminway House on Friday, September 29th. Plans were formulated for keeping the Heminway House open all year, and for a series of special entertainments as were inaugurated last year. Officers for this year are: Floyd S. Carpenter, president; C. Krieg Failing, vice-president; Herbert Hutchinson, secretary; Prof. F. C. Wagner, faculty advisor.

CAMERA CLUB MEETING.

The first meeting of the Camera Club was held on Sept. 29th, and officers for the school year were elected. Harold L. Kessler was given the presidency, and Rudolph Wiedemann and J. S. Petri were elected vice-president and secretary-treasurer respectively. At this meeting it was decided by the members of the club to offer two prizes for the best set of pictures taken on the Wabash trip, a first prize of $1.50, and a second of $1.00. At the time of going to press, the winners of these prizes had not been announced. A social session will be held by the Club in the near future.
SENIOR CLASS MEETING.

The first Senior class meeting of the year was held on Wednesday, September 20. Judging from the attendance and spirit shown this year should be a prosperous one for the class of 1917. None of the old time spirit of "What's the meeting about? Let's get it over with," was shown, and several candidates were nominated for each office. (Remarkable!)

The vacancy in the office of vice-president left by the absence of Risser was filled by Goldstine, and in an extemporaneous speech, or prayer, of acceptance the latter expressed a desire that President Richard be unfailing in his attendance. Senior athletic representatives were also selected. Wente and Binhack, being unable to escape, promised to do their best.

The old time custom of procuring the regulation Senior regalia of corduroy pants is to be followed out this year. It was agreed that, since some kind of pants must be worn, they might as well be of corduroy.

Shop overalls will be purchased and worn during the entire year, instead of for a few weeks at the end of the term, as has been the custom in the past.

A suggestion by President Richard that a get-together session be held met with unanimous approval. All owls are hereby notified to search for safe hiding places, for an urgent search will soon be made for them by '17.

JUNIOR CLASS MEETING.

At a meeting of the Junior Class held in Prof. Hathaway's room on September 22nd the following officers were elected: president, R. P. Long; vice-president, Forest Furry; secretary-treasurer, John Wagner; athletic representatives, Yatsko and Orr. At a meeting held three days later it was found necessary to elect Dan M. Howard to the office of Junior representative in the Student Council, due to the fact that President Long had been elected Financial Secretary of the Council at the meeting of that body held on September 23rd.

A meeting will be held in the near future to discuss plans for the banquet and Hallowe'en celebration.

SOPHOMORE CLASS MEETING.

The Sophomore Class held a meeting on Saturday, September 23rd, for the purpose of electing officers. The following men were chosen: president, H. Winton Streeter; vice-president, John C. Zimmerman; secretary-treasurer, Richard P. Gillum. John C. Zimmerman was given a vote of thanks for his able leadership and organization of the class for the Challenge Rush.

A committee consisting of the following men was appointed to formulate plans for a class banquet: L. S. Stinson (chairman), Leland S. Kurfess, W. R. McKeen.

George Owens and Adolph E. Reinhard were elected to represent the class on the Athletic Board.

FRESHMAN CLASS MEETING.

The first meeting of the class of 1920 was held on September 20th. P. J. Grafe, of the Junior Class, presided during the balloting for president, after which the chair was turned over to the newly-elected president, Ralph Waggoner. The other officers elected were as follows: Vice-President, Werneke; secretary-treasurer, King; athletic representatives, Hoff and Conover.

FRATERNITY NOTES.

The Theta Xi Fraternity held the first dance of the year at the chapter house on Wednesday evening, October 4th. Fifteen couples were present and enjoyed the program of eighteen dances which was carried out. Doctor and Mrs. Johonnott acted as chaperons. The programs were in blue and white, the colors of the fraternity. Music was furnished by the Koerner-Charman Orchestra.

The local chapter of Alpha Tau Omega has just moved into new quarters at 1002 North Eighth St. The chapter has been located at
various places since its founding in 1894, but it is now believed that it is at a more suitable location than it has had for several years. All Alumni are invited to visit the chapter when they visit the city.

Barton R. Shover, class of 1890, who has just returned from Sakchi, India, where he has been for the past two years as general manager of the Tata Iron and Steel Co., visited the Institute on October 7. While at the school, Professor Peddle induced him to favor some of the members of the Senior Class with a short informal talk which was thoroughly enjoyed by those who were fortunate enough to be present.

Mr. Shover, while returning from India, spent some time in Japan, and while there visited an old classmate, Taro Tsuji, who, it appears, has prospered since he left Rose in 1890, and has now retired from active professional life.

Mr. Shover said that from his own experiences he had concluded that there was no such thing as cheap labor. He said that labor costs in India were higher than in America in spite of the fact that the ordinary laborer there is paid an average of nine cents a day, and that other wages are proportional. Speaking of the pleasant things of India, he said that he believed that the cooks of India could be excelled nowhere. He also spoke of the servants of India and their peculiarities. It would seem, from Mr. Shover's talk, however, that India's unpleasant climate more than outweighs her fascinations. Mr. Shover had not expected to return to the United States until next year, having signed a three year contract with the steel company, but returned sooner because of the ill health of his wife. He was fortunately able to cancel his contract.

The Technic may continue to labor along with mediocre talent for quite a number of years, but if the staff is able to hang together until 1937 we may rest assured that the troubles of those connected with it will be at an end. A new editor-in-chief arrived at the home of Professor Wischmeyer on Sunday, October 1st, and to Professor Wischmeyer is to be extended the hearty congratulations of the faculty and the student body of Rose.

STUDENT COUNCIL MEETING.

September 23, 1916.

Meeting called to order by Richard.
Organizations not represented: Camera Club, Symphony Club, Athletic Association, Scientific Society.
Junior Class. President Long of Junior Class given seat as Financial Secretary.
Hild and Richard nominated for President. Hild elected.
Streeter and Carpenter nominated for Recording Secretary. Carpenter elected.
Moved by Richard, seconded by Waggoner, that the Financial Secretary be elected from the Junior Class. Carried. Long elected Financial Secretary by Council from names submitted by Dr. White.
Moved by Long and seconded that the regular meetings of the Student Council be held at 7:30 p.m. on the first Friday of each month in the Heminway House. Carried.
Hild appointed Streeter and Richard on committee to organize a band.
Special meeting of the Council called by President Hild, to be held in Heminway House on September 26th at 7:30 p.m.
Moved by Carpenter, seconded by Streeter, that a committee be appointed to see Dr. White about a mass meeting to be held Friday afternoon. Carried. Waggoner and Long appointed on the committee.
Hild resigned as cheer leader.
Richard excused from meeting.
Moved by Long, seconded by Waggoner, that a new cheer leader be elected and given
power to appoint assistants. Carried. Streeter
nominated for cheer leader by Long, seconded
by Waggoner. Streeter elected.

Streeter moved that meeting be adjourned,
seconded by Carpenter, and motion carried.

FLOYD CARPENTER,
Recording Secretary.

STUDENT COUNCIL MEETING.
September 26, 1916.

Meeting called to order by President Hild.
at 7:35 p. m.

Members present: Hild, Richard, Carpenter,

Organizations not represented: Scientific So-
ciety, Camera Club and Symphony Club.

Reading of minutes of previous meeting
omitted.

Results of votes for President and Secretary
of Athletic Association read. Wente elected
President, and Owens elected Secretary. Moved
by Carpenter, seconded by Waggoner, that
Wente be given a seat in the Student Council.
Carried.

Long, Financial Secretary, reports that he
received from Dr. White and deposited in
bank $73.37 from last year’s student fund.

Long, for the Committee, reported that Dr.
White has given the hour from 11:00 to 12:00
on Thursday, September 28th, for a mass
meeting.

No report from Band Committee.

Discussion of mass meeting. The four class
presidents appointed marshals of “pep”
meeting.

Richard reports that green caps for Fresh-
men have been ordered. Moved by Richard,
seconded by Long, that on all school days ex-
cept Saturdays the Freshmen wear their green
caps everywhere from 7:00 a. m. till 5:00 p. m.
and on Saturdays from 7:00 a. m. to 12:00
noon; the caps also to be worn to all school
affairs on Saturdays at any time. Carried. The

Presidents of the three upper classes appointed
as a vigilance committee to see that the green
caps are worn.

Moved by Wente, seconded by Long, that the
time of regular meeting of the Council be
changed from night of the first Friday to
night of the third Friday of the month. Car-
rried.

President Hild appointed Richard, Wente
and Long to audit the books of Student Fund.

Moved by Richard, and seconded by Wente,
that the Financial Secretary be authorized to
send a check to Risser for the commission due
him while Financial Secretary, the amount to
be determined by the report of the Auditing
Committee. Carried. Secretary instructed to
write to Risser telling him of action of Student
Council.

Moved by Waggoner, seconded by Carpenter,
that the Athletic Board be allowed sixty cents
for each man who goes to Crawfordsville, the
Football manager to turn over to the Financial
Secretary a list of those making the trip. Car-
rried.

Moved by Richard, seconded by Streeter, that
the Council allow a dollar and sixty cents to
each member of the Band making the trip to
Crawfordsville, provided that enough go to
make a good band. Carried.

Hild appointed Carpenter and Streeter a
committee to order Student Council cards and
stationery.

Moved by Wente, seconded by Richard, that
$50 be paid to The Technic from the General
Fund, to pay for the increased cost of paper.
Carried.

Discussion of plans for general assemblies.

Moved by Long, seconded by Streeter, that
a committee be appointed to make plans for
general assemblies and to get speakers on en-
gineering subjects. Carried. Carpenter,
chairman; Long and Wagner put on commit-
tee.

Streeter presents his resignation as cheer
leader. Moved by Wente, seconded by Richard,
that Streeter’s resignation as cheer leader be accepted. Motion amended by Long that Streeter’s resignation be accepted if the new man elected would accept the place. Amendment accepted. Motion carried.

L. Allen elected cheer leader.

Whelan elected to take Risser’s place on St. Patrick’s Day Committee.

Moved by Wente, second Long, that meeting be adjourned. Carried.

FLOYD CARPENTER,
Recording Secretary.

LOCAL HEROES

I.

JAP DAVIS

Although his name is Raymond S. Davis, away back in the dark ages when he attended grammar school, some of his childhood associates decided that he possessed both the appearance, and the polite, good natured disposition of a citizen of the land of the Rising Sun. Therefore he was tagged with an appropriate label which gradually dwindled down to the short prefix “Jap” by which he is known today.

Jap’s particular forte is football. That is why they made him captain this year, and as he has had about seven years experience at the game he should and does know as much about the history of Rugby as most of the DePauw sharks know about the history of education.

When he starred in High School, and was subsequently elected to the captaincy of a team which lost the state championship by only one point he was drilled and badgered by one N. G. Wann, a bald headed, sarcastic personage who knew a great deal about both football and the make-up of the ordinary high school youth. At the behest of this authority Jap memorized the contents of two or three rule books and in turn became an authority on “that inside stuff” about which we used to hear so much from Bruno Kline.

When he entered Rose he did so very modestly, and confidentially with much inward quaking as to the fate which would befall him, but he had no more than finished listening to Doc’s annual spiel, than a couple of rough looking Juniors entered and informed the assembled Frosh that there was a hot time in store, and straightway the fearful crew appointed Jap to guide them through the troubled waters of their first week’s stay at the Institute. And it was not Jap’s fault that his gang was cleaned, either. After that first fatal fray Jap gathered a few huskies who were perhaps more ambitious than husky, for instance, Is-he, Selfie, and a few other rough ones, and led an attack on a brigade of Sophs who were transporting some neatly chained Freshmen to the wilds of West Terre Haute. The fight occurred on the river grade, and here, at least, Jap’s gang triumphed.

The next thing he did was to accompany the football team to Lafayette and play enough football to suffice for the whole team. Purdueites think Jap is a real football player.

He was also elected to the Athletic Board in his first year. He began his career as a basketball player in his first year, and has stayed
with that all through the course, attaining the captaincy last year.

Jap may be aptly described as a mountain of humanity crowned with a smile. If we were all like him some of us might grow conceited, for there would be no one around to grab the game and tell us all about our own and the other fellow's faults. He's a good fellow, is Jap, and when everything else is said and done we may conclude by remarking that Jap is a living monument to dispute the rule that a man may not be both married and ambitious.

THE PAVING BRICK MANUFACTURERS' CONVENTION

TERRE HAUTE attracted to herself more than a little attention from engineers and road builders on October 5th and 6th, which dates marked the thirteenth annual convention of the National Paving Brick Manufacturers' Association, which was held in this city. The gathering attracted wide notice this year and was attended not only by brick manufacturers, but by a number of engineers and college representatives as well. Among those present were these: Professor Lawson of the Rensselaer Polytechnic Institute; W. A. Alsdorf of Columbus, O., author of the Ohio road law and secretary of the Good Roads Federation; Frank Rogers, highway commissioner of Michigan; Ira O. Baker of Illinois University, author of a standard work on roads and pavements; Prof. Leonard Smith of the University of Wisconsin, one of the most diligent students of roads in the United States; Henry Metzel, chief engineer of Columbus, O., and chairman of the paving commission of the American Association of Municipal Improvements; Professor Benjamin, dean of the College of Engineering at Purdue; Professor Tucker of the University of Oklahoma, and a number of others.

Terre Haute as the scene of a brick manufacturer's convention is singularly appropriate in that the first clay working undertaken in that section of the country had its beginning here in the Wabash valley.

The features of the convention were the inspection trips of Friday, October 6th. South Sixth street, which is over a quarter of a century old and is considered one of the best pieces of work of its kind in the state, was inspected, and later a trip was made to Paris, Ill., where various paving works of that city were shown to the visitors. While in Paris the association members were able to witness the actual laying of brick roadway.

The newly elected officers of the association are: President, C. C. Blair of Youngstown, O.; vice president, J. W. Robb of Clinton, Ind.; treasurer, C. C. Barr of Streator, Ill.; secretary, W. P. Blair of Cleveland, O., and assistant secretary, H. H. Macdonald of Cleveland, O.

RULES FOR ROOTING

Keep one eye on the cheer leader at all times. Bring your arm bands, megaphones and pennants.

Sing for all you are worth, and keep together.

Applaud good plays, no matter what side makes them.

Cheer harder than ever if the team appears to be losing.

Do or say nothing, no matter what happens, which will be offensive to the losing side.

Remember that whether alone, in a small group or a large one, you are making a reputation for Rose.

Let the team know you expect it to win.

Let it be your everlasting shame if you haven't a husky voice at the finish of the game.
On Sept. 23rd the Rose football team after going through one practice game on the preceding Saturday went up against a team picked from Rose varsities of the past and after a hard struggle, the ancients proved that the sands of time had not yet worn away their old time football ability. The game was interesting throughout and it looked like a shutout for Rose till the last few minutes of play when two forward passes, Hoff to Glynn, netted two markers which came within three points of tying the score, 17 to 14. The Alumni team showed wonderful endurance, something rarely to be said of such an organization and in facing this team the Rose eleven faced not only a team of stars of yesterday but of today. A glance at the line-up will show the calibre of the men.

To start the game, Bradford kicked to Rose and the ball was returned to the 30-yard line. Rose tried nothing but line plunges in attempting to “cork” the Alumni but with no luck, and Glynn dropped back to kick, but in some fashion he and Hoff mixed after the ball was snapped and the kick landed on Hoff instead of on the ball. Alumni took the ball and with a series of plunges, end runs, and short passes marched down the field for a touchdown. Bradford kicked goal. The quarter ended just as the teams lined up. Score, Alumni 7, Rose 0.

In the second quarter the ball see-sawed up and down the field until finally “Goney” Goldsmith carried it over for the second marker. Bradford kicked goal from a difficult angle. Score, Alumni 14, Rose 0.

Alumni carried the ball to Poly’s 30-yard line in the third quarter. Bradford failed at placement. On the kick-out, Bradford received the ball on the thirty-yard line. Bradford’s second place kick sailed between the bars. Score, Alumni 17, Rose 0.

In the last quarter, Poly cut loose and displayed a burst of speed that swept the Alumni off their feet. The ball was carried down the field to Alumni 30-yard line and a pass, Hoff to Davis, netted 15 yards, and after an off-tackle failed, a snappy pass, Hoff to Glynn, scored the first Rose touchdown. Hoff kicked goal. On the kickoff, Rose brought the ball out to her 40-yard line. End runs and passes netted 30 yards. On the next play Hoff passed 30 yards to Glynn, who scored the second marker. Score, Alumni 17, Rose 14.

Line-up:

Poly. Alumni.
Floyd C. LeForge
Bake L.G. Carter
Davis L.T. Gray
Orr L.E. Gillum
Henry R.G. Standau
Barnes R.T. Moore
Anderson R.E. Lammers
Werneke Q. Bradford
Glynn F. Goldsmith
Hoff R.H. Baxter
Buck L.H. Shook

Summary—Touchdowns: Standau, Goldsmith, Glynn, 2. Goals—Bradford, 2; Hoff, 2. Place kicks—Bradford. Substitutes—

ROSE—WABASH.

Mixing sensational forward passes with a steady game of line plunging, Wabash downed the Engineers of Rose 24 to 0. The game was played at Crawfordsville and a crowd, estimated at 2,500 witnessed the game. Both teams showed a lack of practice, seen in all early season battles. The Rose trick plays and forward passes worked poorly against the heavy scarlet team and it was due to the efforts of the line that the Engineers advanced as well as they did. Gale, at fullback, played perhaps the best game for Rose, and the best defensive game of any man on the field. This little half seemed to stop every scarlet play. The Rose line did remarkably well. Every man fought and fought hard. Grafe, Barnes and Davis deserve special credit for their alertness. Glynn had poor luck with his punts in the early chapters but hit his stride in the last quarter. Hoff got his passes off well, although he was hurried, but on every occasion our receiving end was too well watched by the scarlet.

One of the biggest features of the game was the “pep” shown by the students. Manager Aitken chartered a special train to carry the “gang.” The train consisted of three coaches, all of which were packed, and a “Wabash” furniture car to carry the Rose elephant, who was all dolled up for the occasion. About 150 rooters made the trip by train and they were royally entertained by James Sousa Whelan and his band, which went from car to car playing any selection called for.

The Frosh in “the baggage car ahead” amused themselves by firing their artillery at all flag stations and water tanks.

Arrived at Crawfordsville, one Walter Charles Wente of DePauw fame appeared from somewhere and proceeded to liven things up on the march to the Campus. The students stuck with the mascot and after parading around the field, anchored her near the Rose section of the bleachers with the Frosh and their cannons on guard. Yell Leader Allen and the above mentioned W. C. W. kept the rooters on their toes and it was only once in a great while that the feeble Wabash voices could be heard between cheers for Rose.

Rose (0) Wabash (24)
Orr, Anderson,
Wagner.............L.E....Poulson, Coffey
Bake, Henry.............L.T.......... Buyer
Henry.............L.T.......... Buyer
Cauldwell, capt.
Floyd.............C. Stonebraker, Haley
Barnes,.............C. Stonebraker, Haley
Henry, Boring.............R.G...Woodard, Hagis
Davis, capt.............R.T. Hanniker, Mikels
Clemens, Moses,
Glynn, Wagner.......R.E.... Walker, Heald
Werneke.............Q......Linsey Walker
Anderson.............L.HB....... Tingley
Buck, Yatsko,.............Vermillion
Anderson.............L.HB....... Tingley
Mons, Sims,
Hoff................R.HB.... Thompson
Gale................F.B....... Bacon
Summary: Touchdowns—Bacon, 2; Green, 1. Goal from field—Poulsen. Goals—Hanniker, 2; Cauldwell, 1. Officials—Robinson, referee; McKay, umpire; Wilder, head linesman.

A Fall Tennis Tournament, something new at Rose, started on October the fifth. Twenty-one men have signed up and the affair promises to be hotly contested. A silver cup is up for the winner. The following men are competing: Stimson, Goldstine, Cromwell, Walker, Mendenhall, Rector, Maxwell, Bixby, Lawson, Springer, Fuqua, Petri, Thiry, Wernher, Falls, Everingham, Brown, Smith, Leathers, Schonefeld and D. H. Richardson.
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Y. M. C. A.
City Y. M. C. A.
Interesting Happenings of the Month

THE QUEBEC BRIDGE COLLAPSE

September 11, marked the second collapse of the National Transcontinental Railway’s bridge across the St. Lawrence river at Quebec. The first structure which was begun in 1903 collapsed in 1907 when about 240 feet of steel superstructure had been completed. The last accident occurred just as the middle span of the bridge was being hoisted into position, when it is thought a casting connected with one of the four lifting chains broke and allowed the span to slip off into the water. No blame is placed upon any of the engineers in charge, for the whole work was carried out according to the best practice of the day, and in spite of the apparent failure in the one detail, the bridge as a whole is regarded as a marvelous piece of work.

The collapse of the central span put the other parts of the structure to a most extraordinary test, which they were able to successfully withstand. Some idea of the violence of the reaction may be obtained when one learns that the suspension of the span from the cantilever arms deflected their ends between 9 and 10 inches and that when the suspended weight tore itself loose, men on the ends were thrown down, while the vibration lasted long enough for one man to run about 250 feet towards the anchorage.

Work on the bridge will be carried on as rapidly as possible in spite of the mishap, but in the future rolled steel will entirely displace steel castings.

The Quebec bridge possesses the longest span from pier to pier of any structure in the world. Its nearest competitor is the famous Firth of Forth bridge.

BRITAIN'S NEW LAND DREADNOUGHTS

GERMANY is evidently not the only nation capable of developing new and startling methods of warfare, for according to the latest reports the British have evolved what might be termed a land dreadnought. Very little definite information concerning the “Tanks,” as they have been dubbed by the British Tommies, is available, but it is thought that they are an adaptation of the well known “caterpillar” farm tractor. Fantastic stories have been told about the deeds of these new fighting craft. They are said to be capable of ploughing through a forest and mowing the trees down like match sticks, that they can cut up houses and walk right over them, climb barricades, demolish dugouts, and traverse ground pitted with shell craters and cut up with trenches without the least difficulty. They are described as terrestrial monitors, mobile fortresses, steel tortoises, and toads of vast size.

It appears that they made their first appearance on the morning of September 15, on the Somme front when the troops under General Haig advanced and pierced the German third line of defence. One can imagine the feelings of the German troops as they beheld these steel clad monsters advancing towards them over the broken ground and through the barbed wire entanglements, utterly unmindful of the rain of shrapnel and machine gun fire, dealing out death and destruction as they came. Small wonder it was that, as General Haig’s report sets forth they caused “indescribable demoralization in the enemy’s ranks.”
Prof.—“Now about the pdv’s at this time t.”
Stude (undertone)—“Too cold now, let’s talk about some fleece lined.”

Prof. Thomas (in Hyd.)—“I’ll just say a few words about this to make it more complicated and confusing.”

King Coles—“Mr. Connelly, tell us one way of obtaining oxygen.”
Freshman Connelly—“Well, they get it out of tanks!”

An exchange tells about a young fellow in a neighboring town, who was working for a Jewish merchant. He hit the boss for a raise, and the boss got his pencil and paper and started figuring.

“There are 365 days in the year and you work eight hours a day, that makes 122 days that you work.

“There are fifty-two Sundays, which leaves seventy days.

“There are fourteen legal holidays and two Jewish holidays, which leaves fifty-four days.

“You get one hour for lunch, which makes forty days and leaves fourteen days.

“I give you two weeks vacation in the year.

“Now, Venin The Hell Do You Work?”

A Situation.
“Red” Glynn (real Irish) talking German in a French class.

Hair Tonic Wanted.
See Bruning, ’19.

Prof. in Math.—“And now we get X=0.”
Fresh—“See—all that work for nothing.”—Lehigh Burr.

Chemistry Professor—“I will now take some hydrogen, and then I will take some chloroform—”

Sleepy Voice from the Rear—“Good Idea.”—Missouri Outlook.

Mr. Wayne C. Woodling desires it to be known that he is captain and coach of the Rose second team. At his special request we state that he has always been a loyal worker and that the honor is justly due him. In our own judgment, however, the Differentials Department is the only proper place for such statements.

Prof.—“You’re late again! What’s your reason?”
Stude—“Why, a cop stopped me for speeding.”

Angry Father—“What made you flunk in German, son?”
Offspring—“Unpreparedness, dad.”

FRESHMAN BRAINFOOD.

With two small white drinking fountains each giving out a little bubble about three-eighths of an inch high, it takes three-quarters of a minute for one man to get a drink. If there are two hundred twenty-five students how many can get a drink during a five minute period?

The Freshman giving the best solution will get to ask Doc if we can get more water turned on.

In our next issue we expect to offer a handsome lead and leather medal as a prize to any ’20 man for the best design of a spoon-die, square drill, smoke stack reamer, noodle slicer, cork pulverizer, cutting-on tool, or curb stone bender.
Ye Men of Rose!

Varsity fifty-nine, in Hart Schaffner & Marx, is the really Classy Suit for the young fellows. New English models in Overcoats, Hats, Shoes, Shirts, Sweaters, Underwear, and all Men's Furnishings. Always the newest and the best in everything. **Tune Brothers**

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TEN PER CENT REDUCTION TO ALL ROSE MEN

Instructor of Sporting Volunteers—“Give your numbers!”
Squad—“1, 2, 3,... 8, 9, jack, king, queen, ace!”

Farmer—“Where have you been all the time and where is the horse you had shod?”
Young Hand—“Shod, sir! I thought you said shot. I have just been burying her.”

Recruit—“I don’t see what makes you so fat.”
Vet—“Soldier food, my boy, it goes to the front.”

“And what is this?”
“My bathing skirt.”
“Oh, yes. I thought it was a belt.”


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**TOO BAD.**

Social Worker—“Do you obey the Bible injunction to love your neighbor?”

Freshman—“I try to, but she won’t let me.”

We did not see him come or go,

We do not hear him any more,

For what he thought was H₂O,

Was H₂SO₄.

—Purdue Exponent.

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**THAT TIRED FEELING.**

He—“But doesn’t my devotion arouse in you some feeling for me!”

She—“Oh, yes; the sort of feeling one takes a tonic for in the spring.”

Son—“Dad, when can a man be said to have horse sense?”

Dad—“When he can say nay, my son.”

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**THE LIVE ONES OF TERRE HAUTE, YOUR FRIENDS.**

Study this list fellows. They are the men of Terre Haute who are interested in seeing Rose go to the front. These men who are strangers to some of you are the men that want to help you. They are bound to offer you better bargains than strangers. They have shown that they are for Good Old Rose. When a man comes out and puts his money behind you he is the man to tie to. All kinds of business is represented. There is no need to go beyond the ranks of our own little crowd to purchase a single article this year. Stick to these men, boost their business to your friends about the city, and see that they get every dollar you have to spend for supplies. These are the men who are making Terre Haute and these are the men who will help Rose whenever they are called upon.

| Spencer Ball, C. C. | R. F. Marley, Office Supplies. |
| Carl Bauermeister, Wholesale Grocer | Siegel’s, Ladies’ Clothes. |
| L. D. Smith, Athletic Goods | Viguecheon, Printers. |
| Ed Sparks, Gent’s Furnisher | Jas. Royce, Banker. |
| Kleemans, Dry Goods (Dept.) | McCurdy’s Lunch Room. |
| Roots, Dept. Store. | Myers Bros., Gent’s Furnishers. |
| Silberman, Furniture. | Petersdorf’s, Ladies’ Clothes. |
| Ben Blumberg, Lawyer. | Valentines, Drugs. |
| Buntin Drug Co. | The Gas Co. |
| The Deming Hotel. | Wade Duncan’s Cafe. |
| Stimpson, Stimpson, Hamill & Davis | Levi Dry Goods Co. |
| H. A. Condit, Real Estate. | Traction Co., Five Tickets. |
| Woodburn Printing Co. | George Standau. |
| John Crawford, Banker. | Ermisch, Cleaners. |
| Weinstein Bros., Gents’ Furnishers. | Smith-Alop, Paints. |
| | Mewhinney’s, Candies. |
| | Harvey Furniture Co. |
| | Manford Collins, Printer. |
| | Temple Laundry. |
| | Model Ice Cream Co. |
| | Furnas Ice Cream Co. |
| | Bell Phone. |
| | F. Allen. |
| | Lee Goodman Sons, Furnishers. |
| | Stahl-Urban Factory. |
| | Deep Vein Coal Co. |
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| | T. H. Boiler Works. |
| | Plaza Restaurant. |
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| | J. Levering and Son. |

—Paid Advertisement.

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“Pa, what’s an echo?”
“An echo, my boy, is the only thing that
   can beat a woman out of the last word.”

“Has Jack any artistic ability?”
“The only thing I ever saw him draw was a
cork.”—Jester.

“I don’t see any reason for these short
   skirts.”
“I do. I see two of them.”

Junior—“Doctor, what is prohibition in
   German?”
Doctor C.—“There isn’t any such thing.”
—Yellow Jacket.

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4,000 Costumes.
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