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Rose Thorn Staff
Rose-Hulman Institute of Technology, library@rose-hulman.edu

THE ROSE TECHNIC.

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OUR Indiana college presidents seem to have taken the initiative in making a very decided stand against foot ball as now played. Many college men pronounce this action as "fogyism," but we believe that if they will carefully look over the list of foot ball casualties for the past season they can not fail to agree that the game, at least for amateur athletes is not quite what it should be. Students usually retreat behind the cloud of popularity which at present surrounds the game and will seldom give their true opinion of it. Yet every man knows that after learning the score the next inquiry made is concerning the number of casualties, and if the injuries are slight or none at all, congratulations are then in order. This one thing tells us quite plainly how great are the dangers of the game. We do not intend to join in the wholesale condemnation in which the press indulged immediately after the last echoes of triumphant college yell had been reported and the gridirons afforded no other news. Their charges of brutality are by far too strong, for though the game of necessity is very rough, yet the players are usually gentlemen and take no unfair advantages, much less do they attempt brutality.

The college men in his patriotism thinks little of strains and broken limbs so long as they are sustained in contests to the honor of his college. But should he be maimed for life and his career perhaps ruined he will find that college patriotism is not the patriotism of the masses, that the sympathy for him extends but little farther than the campus gates.

The primary object of our institutions of learning, of course, is to prepare the student for a useful career in life, and to be consistent any factor which obviously tends to unfit him for his real work should be abolished.

Foot ball with its many good qualities for developing a man, in the best sense of the word, both in mind and muscle should not be allowed to disappear from the athletic field. But the greater dangers should be eliminated while the necessity for manly strength, steady nerves and quick judgment should still be retained. Our college presidents have not stated just how the game is to be remodeled to their satisfaction, but doubtless they will be able to furnish us with a game which will be acceptable. The outcome of their crusade will be watched with interest.

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DR. MENDENHALL seems to have captivated the athletes of Worcester Polytechnic with the plan of having one athletic association to govern all branches of athletics in that institute. We are only astonished that Worcester has not concentrated its forces ere this. We can attest as to how successful such management has made Rose in Indiana contests.

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THE first "bulletin" of the R. P. I. has just been issued, it being a compilation by Prof. Gray, of the various physical units. A short introduction to the use of dimensional formulas and

conversion factors is followed by the definition of the units given in concise forms, with their dimensional formulas and conversion factors. This pamphlet of some thirty pages is of no little value as a book of reference, and doubtless will be in demand among the students and alumni. We hope the faculty contemplates issuing these bulletins not infrequently, setting forth in concise forms the knowledge so often hidden in an author's volubility of expression or scattered through a library of text books, and in either case being inconvenient for reference by the busy engineer.

In the course of time the technical schools will do no small amount of publishing, not only issuing college journals and bulletins of scientific progress, but also printing such pamphlets as will, when used in connection with the lectures, supercede the present method of using text books. Though text books are seemingly abundant, it is astonishing how few meet the requirements of such a school as R. P. I. Professors Ames, Noyes, Howe, Gray and Hathaway have all published texts for use in their various departments, and the present Junior class is taking dynamics without a text book, none being quite suitable to their needs. Prof. Hathaway, in lectures upon this subject, will compare the usual analytic methods with the quaternion methods, and we may be sure that many of the comparisons will be favorable to the latter.

It is not difficult to see the manifold advantages to be derived from having a printed guide, expressly intended to be a substructure for the course of lectures rather than having a text book designed for universal instruction and perhaps illy fulfilling the peculiar requirements of any one class.

* * *

CHARLES F. THWING in an article in the January *Forum* on the increased cost of a college education brings to light some interesting figures, being comparisons of salaries of professors, of tuition fees and necessary expenses of the past and present. He seems to find it difficult to understand why the rich should wish to pay less tuition for the education of their children than the education costs in salaries to the professors, etc. He also states that many would-be benefactors withhold their endowments from colleges because such endowments cheapen the education to all students, and hence the rich man's son reaps the same benefit as the impecunious student. Upon these facts and fallacies he builds a scheme for cheap education for the poor which would do well to appear in the next edition of Bellamy's "Looking Backwards," and concludes as follows:

"* * * If the American college could increase its tuiton fee to $500 there are not a few men in the college who would be willing and able to pay this fee and who ought to pay this fee, for the fee represents simply what the education costs. With the present endowments, and with the increase of endowments sure to be made, these payments would allow each college to offer an education to men who are not able to pay for it, at a very small cost. Thus every poor boy in America who wants an education would receive it."

The methods of the fortune-maker of the present seem to have been forgotten, and also, in a college where the students hail from all portions of the country the matter of their financial standing is not to be easily determined. We cannot quite see why the would-be benefactor should not resort to the ancient method of establishing free scholarships for the worthy poor.

* * *

ONE who saw *The Chicago Herald's* special train, the "Dixie Hummer" whirling along at the rate of sixty miles an hour towards the Sunny South on that cold wintry morning of the 29th ultimo, could not fail to be impressed with this triumph of literary enterprise and mechanical engineering.

The "Hummer" left Chicago at 2 A.M., intending to make the run to Atlanta, Ga., by 6 P. M. for the sole purpose of conveying a special issue of the *Herald* devoted to a complete description of the proposed "Cotton States International Exhibition" to be held in Atlanta next September.

This whole proceeding makes us realize that the North and South are becoming more closely

united in their business enterprises; that their symapthies are more nearly one than ever before and this we may say is due more to the present perfection in mechanical and electrical engineering than to any other causes. Certain it is that these are the causes which have made the interests of THE TECHNIC coincident with those of the *Georgia Tech*. As the names of the journals indicate, we are in the same field, being the literary exponents of engineering schools. We have always appreciated the enterprise of our young contemporary and have been highly pleased by the occasional words of praise which have been bestowed upon us from our friends in Atlanta. The compliment which we received from that quarter recently was a *coup de maitre*, and one which we can not let pass unnoticed.

In the *Georgia Tech* of last month we find the following editorial which our readers will kindly compare with our own editorial efforts of October last.

"* * * It is useless for us to repeat, at this time, any description of our air castles, but we do wish to say something in regard to the present and the more immediate future.

The new man on entering college, finds that a paper has been established, which appears at stated times, whether the students, as a body, do or do not take an active interest in its publication. He never thinks of doing more than paying his subscription, and sometimes not that much. But much more is expected. The men who have any tendencies towards journalism should show the same interest in the college paper that an athlete exhibits for the college sports. An editorial board endeavoring to edit a college paper, with no aid from the students, is as incongruous as if the managers of an athletic association should attempt to have an exhibition with no help from the athletes. Every student can do something for the improvement of his college paper. Personals, and contributions of every nature suitable to our journal, should be willingly and readily proffered by every member of the institution.

* * * * * * * * *

To the students in general, we request that you do not wait to be asked personally to contribute. Each of you can judge of your ability to write, while it will take considerable time for the editors to become acquainted with you, personally and individually, to be able to know upon whom to call for the support due from your class. * * *"

THE TECHNIC is highly elated over its success in having its matter reprinted in Atlanta and rather thinks the *Chicago Herald* will acknowledge our superior management, special trains being unnecessary since our communications with the far south are by induction.

Perhaps our ideas return to us clothed in better language for their sojourn of two months in the "Cotton States," yet they may still be applied in the same manner. In October we stated that we should not continue the hopeless task of converting the students to our ideas concerning their duties towards our college paper, nor should we again refer to the matter had not this echo of our thoughts thus strangely found its way into our columns. In this connection be it said that we are greatly pleased with the support which THE TECHNIC has received thus far, though of course there is vast room for improvement. Verily we have such an "indefinite number" of contributors in the Freshman class that we are somewhat perplexed as to just which one deserves the honor of being elected next month to fill the vacancy on THE TECHNIC staff.

THE CALORIMETRIC METHOD OF STEAM ENGINE TESTING

BY PROFESSOR CHARLES S. BROWN.

This method of analysis of the heat transfers and transformations which go on in the cylinder of the steam engine was first proposed by Hirn, and subsequently perfected by the labors of Le Loutre, Hallauer, Mair, Dwelshauvers-Dery and other investigators abroad and in our own country. In this, as in other matters, experimental investigation has settled many important practical questions, and destroyed not a few erroneous theories.

In order to conduct a test of this character, the engine to be tested must be run under constant load, with temperature and pressure of steam admitted as nearly uniform as possible. Measurements of work done in the cylinder should be made at regular intervals by means of the steam engine indicator, and at the same time the weight of steam used during the interval should be determined with its temperature, pressure and quality at admission. From these data the amount of heat carried to the engine may be calculated. The amount of heat discharged from the cylinder may be determined by exhausting into a surface condenser and taking the weight and temperature of the steam condensed, as well as the weight and increase in temperature of the condensing water. This plan gives also a means of determining the actual weight of steam furnished the engine, and is a much more accurate method than that sometimes employed of weighing the amount of water pumped into the boiler, the water level being held constant during the test.

The quality of the steam admitted to the engine can be determined by a calorimeter attached to the steam pipe near the engine and its temperature by an ordinary mercurial thermometer set in a thin metal cup screwed into an opening in the steam pipe.

All instruments should be carefully standardized before and after the test is made, all errors recorded and the readings subsequently corrected.

A careful determination should be made of the clearance volume in cubic feet at each end of the cylinder, and of the displacements of the piston and piston rod. The indicator diagrams should be divided into sections by vertical lines through the points of admission, cut-off, release and compression, the absolute pressures and cylinder volumes including clearance for these several points determined, and the work calculated for the various periods of admission, expansion, exhaust and compression. These data, with the aid of steam tables, will permit the ready calculation of the heat transfers and wastes occuring during a revolution of the engine.

Let the points of admission, cut-off, release and compression be indicated by subscripts 0, 1, 2, 3, and the periods of admission, expansion, exhaust and compression by subscripts a, b, c, d.

If M pounds of steam at pressure p are admitted to the cylinder per stroke with quality x, the total heat admitted above 32° F. is $Q=M\ (x\ r+q)$, or, if steam is superheated D degrees, $Q=M\ (\lambda+c_p D)$ where λ is the total heat in one pound of saturated steam, and c_p is the specific heat of steam at constant pressure=.48.

Suppose M_0 to be the weight of steam retained by compression in the clearance space of the cylinder, and h the amount of heat actually existing in the steam at any point of the stroke, then,

At admission	$h_0=M_0(x_0 r_0+q_0)$	(1)
At cut off	$h_1=(M+M_0)\ (x_1 r_1+q_1)$	(2)
At release	$h_2=(M+M_0)\ (x_2 r_2+q_2)$	(3)
At compression	$h_3=\quad M_0\ (x_3 r_3+q_3)$	(4)

r and q representing respectively the internal latent heat and the heat of the liquid for the pressure at the point taken.

If V_0 is the volume of the clearance space, then

The volume at cut off	$=V_0+V_1$
release	$=V_0+V_2$
compression	$=V_0+V_3$

The specific volume of one pound of steam of

quality x is $v=xu+\sigma$, where u is the excess in volume of one pound of steam over σ the volume of one pound of water. The volume of M pounds of moist steam is then $Mv=M(xu+\sigma)=Mxv$, nearly as σ is small compared with u. For the expression Mxv may be used for greater convenience $\frac{Mx}{w}$, w being the weight of one cubic foot of saturated steam.

The volumes at admission, cut off, release and compression then are

$V_0=M_0\ (x_0u_0+\sigma_0)$ or $\frac{M_0x_0}{w_0}$ approximately. (5)

$V_0+V_1=(M+M_0)\ (x_1u_1+\sigma_1)$ or, $(M+M_0)\ \frac{x_1}{w_1}$ approximately. (6)

$V_0+V_2=(M\times M_0)\ (x_2u_2+\sigma_2)$ or, $(M+M_0)\ \frac{x_2}{w_2}$ approximately. (7)

$V_0+V_3=M_0\ (x_3u_3+\sigma_3)$ or, $\frac{M_0\ x_3}{w_3}$ approximately. (8)

These approximate equations may be used in place of the exact ones, their errors being less than the errors of observation.

Solving the above for values of x, the quality of

steam at admission $x_0=\frac{V_0w_0}{M_0}$ (9)

cut off $x_1=\frac{(V_0+V_1)w_1}{M+M_0}$ (10)

release $x_0=\frac{(V_0+V_2)w_2}{M+M_0}$ (11)

compression $x_3=\frac{(V_0+V_3)w_3}{M_0}$ (12)

In these four equations there are five unknown quanties, x_0, x_1, x_2, x_3 and M_0. Of these x_0 can be taken as unity without sensible error. That this value very closely approaches the actual value for the quality of the steam at admission has been quite clearly demonstrated by many authorities. But even if it were in error some considerable amount, the general results would not be materially affected because the amount of steam ordinarily compressed is small.

By substituting unity for x_0 in equation 5, the weight of steam compressed can be determined, $M_0=V_0w_0$, after which the various values of x can be obtained from the remaining three equations.

Substitution of the values of x of equations 9, 10, 11, 12, in equations 1, 2, 3, 4, give for the heat in the steam at the point of admission, cut off, exhaust and compression.

$h_0=M_0q_0+V_0p_0w_0=M_0(p_0+q_0)$ for $x_0=1$ (13)

$h_1=(M+M_0)q_1+p_1(V_0+V_1)w_1$ (14)

$h_2=(M+M_0)q_2+p_2(V_0+V_2)w_2$ (15)

$h_3=M_0q_3+p_3(V_0+V_3)w_3$ (16)

If W_a, W_b, W_c and W_d represent foot pounds of work done during the periods of admission, expansion, exhaust and compression, their respective heat equivalents will be AW_a, AW_b, AW_c and AW_d, A being the heat equivalent of one foot pound of work or $\frac{1}{772}$. Let Q represent the heat admitted per stroke and Q_a, Q_b, Q_c, Q_d the heat interchanges between the steam and the cylinder walls during the several periods of the stroke.

At admission the heat contained in the steam in the clearance space is h_0. During admission this has been increased by the amount Q brought in by the entering steam. If from this sum be deducted the heat contained by the steam at cut-off h_1 and the heat equivalent of the indicated work done during admission, the remainder will represent the quantity of heat transferred to the cylinder walls, that is,

$$Q_a=Q+h_0-h_1-AW_a. \quad (17)$$

In the same manner starting with the heat contained by the steam at cut-off h_1 and deducting the heat shown at release h_2 and the heat equivalent of the indicated work during expansion, AW_b, the remainder, represents the heat transfer during expansion, or

$$Q_b=h_1-h_2-AW_b. \quad (18)$$

This quantity Q_b has invariably a negative value, showing that heat has been given up to the steam by the cylinder, or in other words condensation during admission has changed to re-evaporation during expansion. During exhaust the quantity heat of h_2 remaining at release is reduced by the amount carried to the condenser, the water

formed by the condensation of the steam itself carrying a quantity Mq_4, while the condensing water G which is raised from temp. t_i to t_e carries $G(q_e—q_i)$.

The work during exhaust is usually negative—that is work is done by the engine in forcing the steam out of the cylinder. The exception is when by early release the work done on the piston by the steam from release to the end of the stroke exceeds the work done by the engine against back pressure. The heat equivalent AW_c of work during exhaust should therefore be added to the heat at release h_2. If from this sum be deducted the quantity of heat h_3 remaining at compression, the remainder will represent the heat transfer during exhaust, or

$$Q_c=h_2—h_3—Mq_4—G(q_e—q_i)+AW_c. \qquad (19)$$

This quantity Q_c is always negative, or in other words the cylinder walls impart heat to the steam during exhaust, which heat is carried into the condenser and wasted.

During compression the quantity of heat h_3 is increased by the addition of the heat equivalent AW_d of the work done by the engine in compressing the steam. Deducting h_0, the quantity of heat in the steam, at the end of the compression period, the remainder will be the heat transfer between cylinder walls and steam, or

$$Q_1=h_3—h_0+AW_d. \qquad (20)$$

If the engine undergoing test has a steam jacket a certain amount of heat is supplied from this source. This quantity may be represented by $O_j=M(x'\ r'+q'—q'')$ when M is the number of pounds of steam supplied the jacket per stroke of quality x', total latent heat r' and heat of liquid q', q'' being the heat of liquid of the water drained from the jacket.

As the average temperature of the cylinder is uniform while the conditions of running are constant, all the heat supplied the cylinder per stroke is either transformed into work, discharged in the exhaust, carried off by radiation, or conduction, etc. If the radiation loss be represented by Q_e then

$$Q_e=Q+Q_j—Mq_4—G(q_e—q_i)—AW. \qquad (21)$$

when AW is the total work done during the stroke, or $AW=AW_a+AW_b+AW_c+AW_d$, the terms of which are to be taken with proper algebraic signs.

For the same reason the algebraic sum of the various amounts of heat interchanged between cylinder walls and steam, with the heat supplied by the jacket must equal the radiation loss, or

$$Q_e=Q_j+Q_a+Q_b+Q_c+Q_d.$$

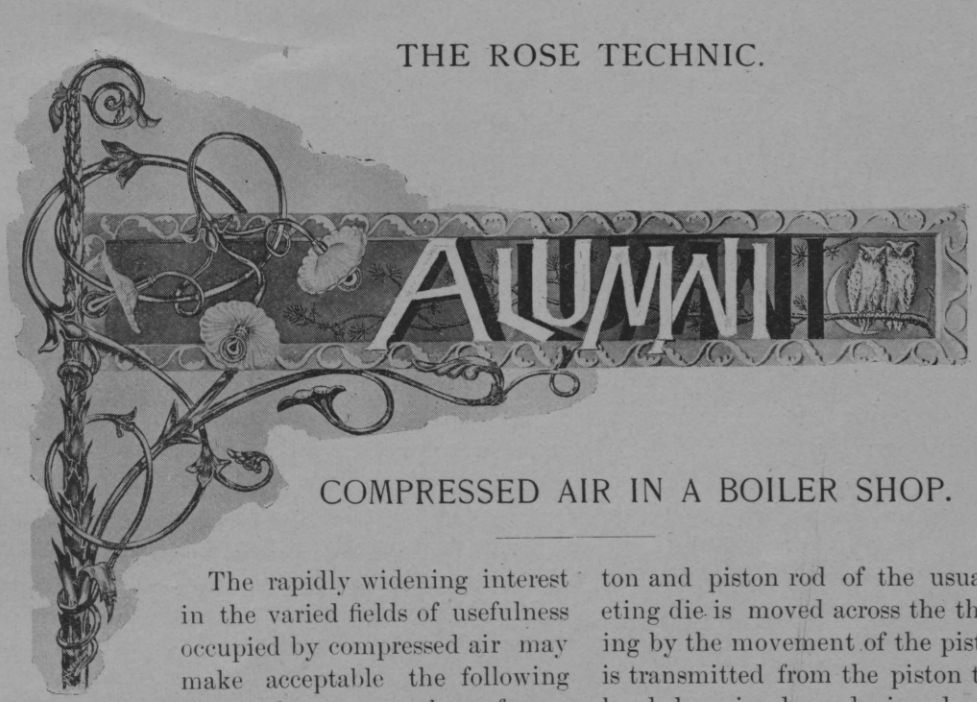
This quantity Q_e may be approximately obtained experimentally by a determination of the amount of condensation in the jackets while the engine is not running.

By combining equations 19 and 21, an equation can be obtained from which the terms Mq_4 and $G(q_e—q_i)$ depending on the condenser have been eliminated, thus:

$$Q_c=h_2—h_3—Q—Q_j+Q_c+A(W+W_c) \qquad (22)$$

This equation is applicable in cases where a condenser is not used. In such a case a calorimeter attached to the exhaust pipe can be used to determine the quality of steam exhausted and the quantity of heat Q_c rejected per stroke. This calculation can be used as a check on equation 22. For testing compound or multiple cylinder engines by this method each cylinder may be considered a simple engine. By means of a calorimeter in the pipe connecting two cylinders the quantity of heat exhausted from the first may be determined and this quantity used as the amount Q′ admitted to the second and so on.

In case calorimetric measurement of the steam exhausted from cylinder to cylinder is impracticable the amount of heat rejected by one to the other may be computed as follows: The high pressure cylinder must discharge all heat which it receives with the exception of that transformed into work, or lost by radiation, then the quantity of heat received by the second cylinder is $Q'=Q+Q_j—Q_e—AW$, to which must be added any heat imparted by a re-heater between the cylinders, or by the second cylinder's jacket. Computation for the heat given to succeeding cylinders may be made in the same manner, and the final results checked by the condenser.

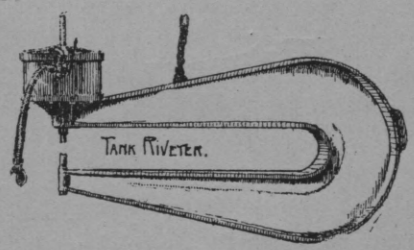


COMPRESSED AIR IN A BOILER SHOP.

The rapidly widening interest in the varied fields of usefulness occupied by compressed air may make acceptable the following notes taken at ashop where a number of very successful compressed air devices were invented and developed.

The Atchison, Topeka & Sante Fe railroad shops at Topeka, Kansas, are the principal shops of the longest railroad system in the world. The shops are extensive, and contain many departments kept busy in building and maintaining rolling stock. There are to be seen a goodly number of shop "kinks" tending to cheapen the labor cost of many shop operations. One of the most noticeable is the use of compressed air in connection with a series of machines in the boiler shop. The usual din of the riveting hammer is replaced almost entirely by the swish of exhaust air from riveting machines. Drilling, tapping, reaming, punching, lifting, bolt-breaking and cutting off are all accomplished by the use of machines mostly developed in the last two or three years, and reducing the necessary number of boiler makers from many tens to a few units.

The riveting machines are in a variety of forms, but they all consist in general of an extended "*C*"-shaped frame, such as is familiar in punching machine forms, having a throat from one to ten feet in depth. Mounted upon this frame at some point is a cylinder with its axis in the general plain of the frame. The cylinder contains a piston and piston rod of the usual type. The riveting die is moved across the throat of the opening by the movement of the piston. The motion is transmitted from the piston to the sliding die head by simple reducing levers, by a toggle joint, or the cylinder is placed directly in line with the die. Each method adapts the machine to some special line of work. These three elements of frame, cylinder and transmitting device are each of great simplicity, and each arrangement of a combination forms a machine in which simplicity and ease of handling are conspicuous. The largest riveter now in use at these shops is one made by Bement, originally intended for a steam riveter, the throat being six feet in depth, and vertical. The cylinder is in line with the riveting die, the steam valve device has been dis-



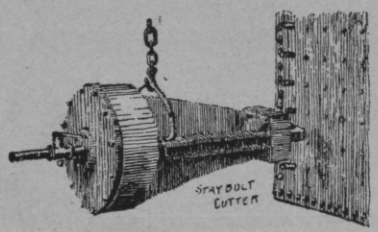
carded and compressed air admitted to the cylinder by a three-way cock in a pipe tapped directly into the cylinder head. The space about the riveter is covered by a bridge crane at the top of a clear space above the riveter of a height sufficient to swing a locomotive boiler on end. A longitudinal or girt seam can be handled between the jaws

of the riveter in this position and nearly every rivet in the boiler put in in this way except the last girt seam at the center of the shell, which is put in by hand.

To take the place of this machine a larger one is planned, having a throat ten feet deep, the frame to be a steel casting of lighter dimensions than the heavy box form of cast iron frame used in the Bement machine.

Another heavy tool using compressed air is a flange punch capable of punching 1¼-inch holes in a ¾-inch plate. The punch has a vertical throat forty-two inches deep, the frame being a heavy cast iron box form. The axis of the 18-inch air cylinder is parallel to the die, but below it. The movement of the piston swings a vertical lever pivoted in the frame, the short end of the lever forcing the die forward. With 80 pounds air pressure about seventy-five tons is exerted on the die.

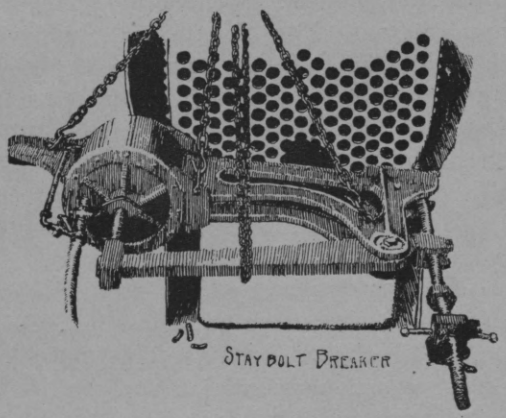
The machines which differ most from the ones commonly seen, however, consist of a line of portable machines. The first of these was a stay bolt cutter invented in these shops, and being rapidly introduced into all railroad shops. It is one of those machines which, doing away with a large amount of hard labor, also does its work in a better manner than the old method, and in but a fraction of the time.



Stay bolts from ¾ to ⅞ inches in diameter thickly stud the side of the locomotive firebox, and when screwed through the two sheets must be cut off just long enough from the sheet to allow for heading over. The old way was to cut off the 700 or 800 bolts with cold chisel and hammer, which frequently jarrred the thread loose in the sheet. The present cutter consists of a 15-inch cylinder, the front head of which carries an axial projection forming a frame in which are pivoted two steel levers in the plane of the piston rod, making a strong pair of cut nippers. The end of the piston rod carries a wedge-shaped block which is forced between the long ends of the cutting levers. This brings the cutting edges together, nipping off the bolt at a distance from the sheet determined by a gauge above the cutters. Air being exhausted through a three-way cock, the piston and levers are brought back by springs. The whole device is swung from a light frame by a traveling differential block, and is handled by two men very rapidly, cutting off bolts at the rate of 1,200 per hour. Besides the saving in time and hard work the cuts are all uniform and have been made without jarring the bolt in its thread.

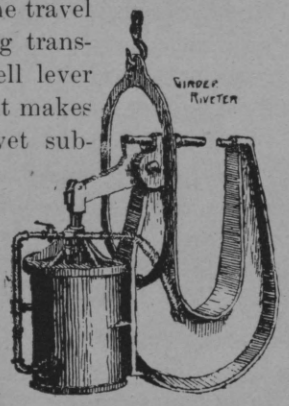
One of the worst jobs about repairing a locomotive boiler is the removal of these same 700 or 800 stay-bolts from about the fire box. The usual method is to cut them off inside the 4-inch space between the inner and outer shell by means of a long cold chisel held by one man while another uses a heavy sledge upon it. To clear out a boiler in this way takes a number of days of severe labor. A portable pneumatic stay-bolt breaker is also in use here. A 15-inch piston with an 11-inch stroke draws down the longer end of a lever which is pivoted in the frame of the machine. The frame is an extension from the side of the cylinder, the bottom of the cylinder and frame forming a straight surface capable of resting fairly against the boiler or the flue sheet. The short end of the lever is forked, and the frame below the lever is also forked. Through these forked portions a breaking bar ten or twelve feet in length runs back into the water space between the boiler sheets and engages a stay-bolt by means of a heavy hook forged on the end. Back of the hook the breaking bar is threaded its full length and holds a collar and slip nut which in working position find a bearing against the fork of the lever. Compressed air depressing the piston, by means of the lever the breaking bar is dragged out with a force of some fifty tons. The hook breaks off the stay-bolt from its bearing in both sheets. The bar is

drawn along by hand to the next stay-bolt, the piston and lever returned by air behind the piston,



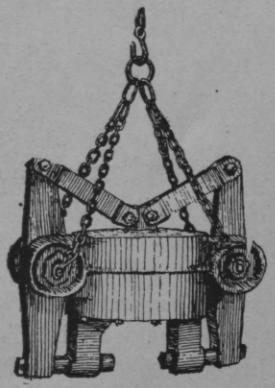
the collar and slip nut again adjusted, and the machine is ready to break another bolt. It is swung from above so as to be easily adjusted from row to row of bolts. A day's work will clear out the largest fire box by this easy method.

Another portable machine is called a girder riveter, but is adapted to a great variety of riveting requiring no very long reach. This riveter consists of the usual frame with a throat thirty-five inches deep and a gap of fifteen inches. The cylinder is mounted in a frame so that the piston rod is at right angles to the travel of the dies, motion being transmitted by means of a bell lever crank. This arrangement makes the pressure on the rivet substantially the same whether it is caught at the beginning or the end of the 3-inch stroke of the die. It also brings the machine into a rather compact form and makes it convenient to swing by a wide spreading bale attached to the center of gravity. As all parts of the machine can swing through this bale it can be used in any position—horizontally, inclined or vertically. It can be attached to a base and used as a stationary riveter also. In order to get the required fifty tons pressure on the rivet and keep the cylinder diameter within reasonable limits so as to pass through the bale, an unique arrangement of cylinders was devised. A fixed diaphragm divides the cylinder into two short cylinders. On the single piston rod two pistons are fastened, one in each short cylinder. Air is admitted simultaneously on the same side of each piston, thereby having the effect of a single cylinder of double the area. Either one or both cylinders can be used, giving a pressure on the rivet of twenty-five or fifty tons.



The most elegant of all the series is a tank riveter, and it also has this double arrangement of pistons. The frame of the tank riveter is especially light and graceful, being a soft steel casting. The double cylinder is placed in line with the riveting die, the die being fastened directly to the end of the piston rod. The machine can be swung either horizontally or vertically, and with its reach of five feet, and small dimensions about the die head, it can reach nearly every rivet in a tender tank. Its capacity, about 300 one-half inch rivets per hour, is not limited so much by the machine as by the ability of the rivet boy to heat and handle rivets.

The same can be said as to the capacity of the mud ring riveter, a special machine looking entirely different from the rest of the class. This machine is adapted to drive $\frac{3}{4}$x4$\frac{1}{2}$ inch bolts through the mud ring and plates about the fire-box, the boiler being placed bottom upwards and the riveter swung from a crane. The device consists of a 15-inch cylinder with the thrust of the piston rod upward. By means of two links forming a toggle joint, the upward movement separates the upper ends of two vertical levers which are pivoted to the reenfocred sides of the cylinder. The lower ends of the levers force the riveting dies together through bearings projecting downwards from the lower

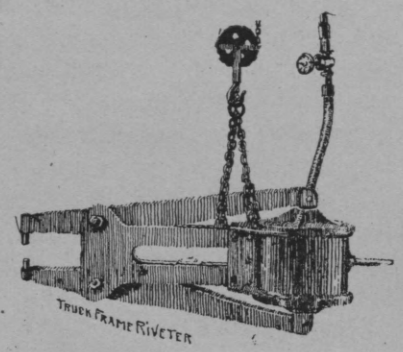


Mud ring riveter.

cylinder head. The whole machine could be put into a box 32x18x28 inches, and is very easily handled. The stroke of the piston is short, but by means of the toggle a pressure in the neighborhood of one hundred tons can be had on the rivet.

One very desirable feature of all these riveters when used with compressed air is the fact that the first part of the blow on the rivet is comparatively quick, having a local effect on the head of the rivet, and thereby forming head enough to grip the plates firmly together, while the latter part of the stroke is a slow and powerful pressure upsetting the rivet its full length and completely filling the hole. In these respects it seems to work much better than the usual hydraulic riveter.

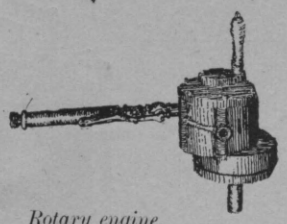
One of the handiest riveters for general riveting where a deep throat is not required consists of a single vertical cylinder containing two separate pistons. Air being admitted between and separating the two pistons, the rods force apart the ends of two horizontal levers which reduce the motion about three to one. The short ends



of the levers carry the riveting dies. The levers are pivoted to an extension on the side of the cylinder forming the frame of the machine. The whole device is swung from the traveler on a crane and is handled about as easily as a common pair of pincers. Air is admitted and exhausted from between the pistons through a three-way cock.

Most of the truck frames on the Santa Fe system are of iron and have from forty to sixty $\frac{3}{4}$ inch rivets which can be driven as fast as a boy can handle them from a heating furnace. Two frames a day from a gang of three used to be considered a fair day's work, while now the same gang turns out one an hour with much less labor, and with but little extra effort a frame can be put up in from 30 to 45 minutes. In straight work about 1,000 $\frac{3}{4}$-inch rivets can be put in with one less man, while 100 could have been put in by hand.

There has been considerable experimenting in this line of developing a light portable rotary machine that can be used for the various operations of drilling, tapping, reaming, etc. For some purposes the little three-cylinder Brotherhood engines are used. For re-boring locomotive cylinders in place, milling port openings, tapping, etc., the engine gives a uniform motion and can be comparatively easily shifted from place to place on trucks. It is of course too heavy for a hand tool. Most any form of rotary engine which has been developed would do, and the one adopted at these shops is adopted from an ancient form of rotary engine known as Mackenzie's. Most of the members of this interesting class of engines can be used either as motors, meters, pumps or blowers, and Mackenzie's rotary is very like a certain molasses measurer which is not uncommon in these days. The engine consists of a short cylinder containing a circular piston of less diameter, internally tangent to the cylinder and whose axis is placed parallel to and eccentric with that of the cylinder. Through the diameter of the piston a sliding diaphragm with movable packing strips on the ends divides the cylinder into two equal



Rotary engine.

parts. Air being admitted behind the diaphragm, it finds the smaller side of the cylinder blocked by the tangent piston and therefore sweeps the diaphragm through the crescent space between the piston and cylinder until it finds an exhaust on the other side. With air at 100 pounds pressure

the diaphragm carries the piston at a rate of about 1,500 revolutions per minute. The high rate of speed is reduced by gearing in the proportion of four to one, six to one, and twelve to one, the machines weighing respectively 28, 31, and 33 pounds. The air is not used expansively in such a device and it is said that these machines use five or six cubic feet per minute. While it cannot be said that these tools are comfortable to work with, on account of the jar which the necessarily unbalanced piston parts give to a man holding the machine, still they greatly reduce the labor of many operations and are light enough to be used in the manner of a hand tool. It is said that two and one-half horse power can be developed by these rotaries.

So far a suitable compressed air calking tool has not been found for this shop, although used in some other places.

In these shops there are many compressed air hoists such as have come into extensive use in the last few years, the only distinguishing feature of these being the rather unexpected good work done by a very cheaply built affair. The hoists range from four to ten inches in diameter and are of various lengths. They consist of a piece of ordinary wrought iron pipe threaded at both ends and covered with a common cast cap. The lower cap is provided with an ordinary packing gland in which steam packing is used to make a joint with the hooked lifting rod which passes through the gland to the piston. The wrought iron pipe forming the cylinder is not bored out or treated in any way. The piston heads consist of a series of iron discs fastened by nuts to the lifting rod. Between the two discs next the air end of the lift a ring of square steam packing is forced to a fit against the pipe by the air pressure being admitted within the ring between the discs. Beyond the ring packing a solid disc of soft rubber such as is used for cold water valves of pumps forms a supplementary packing. Little or no trouble is experienced with this very cheap construction. These are used hung from the traveler of a crane, or invented for lifting cars, trucks, etc., from below, or horizontally for pulling for various purposes.

The compressing plant at these shops is home made. A 16x42-inch Corliss engine was in use furnishing but a part of its rated capacity. The back head of the cylinder was replaced by one carrying an air cylinder 12½x42, and packing glands for the piston rod, which was extended and furnished with another piston in the air cylinder. The air valves are in the heads of the air cylinder, and the whole is water jacketed. The piston speed was reduced to about 350 feet per minute. Air is taken directly from the engine room, and fortunately Kansas air is usually dry. It is piped through the shops in 3-inch overhead mains into various receivers located near the larger machines. There is besides the capacity of the many pipes a reserve storage capacity of about 700 cubic feet, sufficient to run the plant for some hours. No special pains are taken in piping except to arrange so that water, deposited by the air shall drain into places not liable to freeze and can be easily discharged otherwise than through the machines. Air is carried to the various machines from the conveniently located pipe connections by means of hose and couplings such as are used in air brake practice or in common water hose from one-half inch to one inch in size. It can be said that no trouble is experienced from the leakage of air, which is notoriously hard to hold. The reason is that the numerous leaks which undoubtedly discharge considerable power at the 100 pounds pressure usually carried, are allowed to worry no one. The compressed air is cheap is this case, and the refinements nesessary to confine it more closely would probably cost more in this case than the air wasted. If the benefits derived from its use were not so very great this item of waste would probably deserve and receive more attention.

Compressed air possesses many advantages over its numerous rivals which have all had a fair trial for these purposes. An electric motor to develop equal power with the small air rotary would be too heavy to handle as a hand tool. Many men are afraid at first of the subtile fluid in any form who would not think of objecting to an air machine. There is no danger from a break or a leak or a blunder. It is better than high pressure hy-

draulic machinery, principally on account of the fact that no piping is necessary to take away the exhaust. The lower pressure requires no special care in piping as in hydraulic practice. It is altogether more flexible in its capabilities for operating portable tools. In the riveters the character of the blow given is an important advantage. All of these tools can be used with steam but besides rendering tools too hot to handle comfortably steam requires a double system of piping and much loss by condensation. Compressed air can be carried long distances, into unhandy places with such ease, and kept so long a time with so little loss that it seems certain that its present popularity in preference to steam, water or electricity in railroad shops will be lasting and will extend into many new fields.

O. P. Hood, '85.

NOTES.

Although it may be somewhat out of season to read of fresh honors for Rose athletes, nevertheless every one will be pleased to hear that M. L. Oglesby, '92, has been doing some fine work in that line. At the Y. M. C. A. Field Day held near Salt Lake City, July 10, he ran and won the 50, 100, 220 and 440 yards races. Time for the 100 and 220 were $10\frac{1}{5}$ and $22\frac{3}{4}$ respectively. He also won the greatest number of events for which he received a fine medal as well as one for each race. He attributes his success to the colors which he wore, the old rose and white. He is employed by the Salt Lake & Ogden Gas and Electric Light Co., and reports that he is getting along nicely.

Chicago, January 1, 1895.

Al. Ed. Rose Technic:

In the December number of The Technic in referring to the writer you said, "Rumor has it that he will marry a wealthy lady of the Windy City."

Am very glad indeed to hear it. Kindly inform me at once who and where she is and you can name your own reward.

Yours truly,

Sigmund S. Frank.

The St. Louis alumni have extended through Dr. Mees an invitation to the seniors to arrange an inspecting expedition to St. Louis before the end of the year. For engineering enterprises of all kinds, and especially in modern applications of electricity, that city stands very high, and a more profitable trip than that suggested by this invitation could hardly be arranged. The Rose men in St. Louis will certainly do all that is within their power to make such a trip advantageous.

V. J. Gillett, '91, of the firm of Cameron & Gillett, contractors for Electrical construction Detroit, Mich., complimented The Technic with a booklet giving a description of the new Turner building of Detroit. The electrical equipment is first-class and was installed by the above firm.

Among the alumni who visited their best friends in Terre Haute during the holidays are W. A. Layman, '92, Warren Hussey, '92, E. F. Robinson, '94, S. B. Tinsley, '92, T. L. Condron, '90, S. E. Johannesen, '93, and H, B. Sperry, '92.

W. G. Hesser, '93, is traveling expert electrician commonly called "trouble man" for the Fort Wayne Electric Co. He has just completed the installation of a lighting plant in Sullivan, Indiana, and made a short visit to Terre Haute.

Mason Galloway, '90, having spent several weeks in California visiting friends and relatives, returned recently to Marion, Ind., where he is electrician for the street railway company. B. R. Shover, '90, held his position while absent.

The alumni friends and classmates of R. L. McCormick, '91, will be pleased to hear of his marriage. The latter have a right to expect, as a matter of course, after sending in their congratulations, a box of choice cigars.

S. E. Johannesen, '93, who is with the Wagner Electric Co. of St. Louis, has recently been elected member of the Engineer's Club of that city.

R. H. Moth, '93, visited Rose since vacation. He is running a foundry and machine shop in Chicago and reports a good trade.

James Royse, '94, enjoyed part of the recent vacation visiting Stanton, '94, in Indianapolis.

H. S. Hart, '93, is traveling for the Fostoria Carbon Co. of Fostoria, Ohio.

H. B. Sperry, '92, was married December 26th, to Miss Lou B. West, of this city. Mr. and Mrs. Sperry are at home at 44 England street, St. Albans, Vt.

W. H. Waite, '93, is designing for a firm in So. Milwaukee, Wis.

INDIANA COLLEGE PRESIDENTS AND FOOT BALL.

It has been known for a long time that foot ball is not looked upon favorably by the majority of the faculties of the Indiana colleges. However, nothing had ever been done directly to oppose it until recently, when a meeting of the presidents of the various colleges was called at Indianapolis for the purpose of deciding as to how foot ball should be regarded in the future.

At that time it was mutually agreed by them that foot ball, as an inter-collegiate sport, should be abolished, until the rules of the game are amended so as to conform to their ideas. Just what these amendments should be they do not state, but their reasons for the abolition of the inter-collegiate games are embodied in the following resolutions:

WHEREAS, A majority of the institutions of the Indiana College Association, interested in inter-collegiate athletics do not participate in inter-collegiate foot ball; and

WHEREAS, Some of those who have heretofore participated have expressed their desire and purpose to withdraw from inter-collegiate foot ball contests; therefore

Resolved, That, with the concurrence of the faculties of our several colleges, foot ball be and the same hereby is withdrawn from the list of athletic sports to be participated in by members of the Indiana Inter-collegiate Association as an organization, until the laws governing the game shall be so modified as to be satisfactory to us. Provided, that this shall not prevent any college of the association from playing exhibition games in foot ball upon rules mutually agreed upon by the colleges playing.

Resolved, That it is the sense of this body that no college team shall hereafter be permitted to play with any athletic club or any semi-professional organization.

In regard to inter-collegiate athletics in general,

the following rules, to take effect January 1, were adopted:

1. Each college shall appoint from its faculty a suitble committee on college athletics, who shall take general supervision of all athletic matters in their respective colleges, and who shall be held responsible for the enforcement of the college rules regarding athletics.

2. The following regulations shall govern all inter-collegiate contests:

1. No one shall take part in any game or participate in any athletic sport unless he be a bona fide student, doing full work in a regular course as defined in the curriculum of his college, said course leading to a degree.

2. No graduate student of any college shall engage in any inter-collegiate contest for more than two years immediately following the date of his graduation.

3. No professional athlete or other person who has ever received any compensation or emolument whatever for playing in any game or for any athletic feat, shall be allowed to participate in any game or athletic contest.

4. No player of any college shall be paid or receive directly or indirectly any money or financial concession or emolument as present or past compensation for playing, or as prior consideration or inducement to play, whether the same be received from or paid by or at the instance of the college association, athletic committee or faculty of such college, or any individual whatever.

5. No student shall be permitted to participate in any inter-collegiate contest who is reported by any professor as not doing satisfactory work at any time during the athletic season.

6. No student shall play in any game under an assumed name.

7. All games shall be played on grounds either owned or controlled by one of the colleges participating in the contest.

8. The elections of managers and captains of teams in each college shall be subject to the approval of its faculty committee on athletics.

It was also voted, "We, the college presidents of Indiana, furthermore desire to co-operate with the several college athletic associations, and agree to enforce all rules in harmony with the above regulations,"

As will be seen, this does not directly affect Rose as far as inter-collegiate games are concerned, as we have not participated in these games for several years, but such games as those of Thanksgiving day with Louisville and Evansville are prohibited.

The hope had been entertained this season that perhaps by beginning early and practicing hard, next year, we might be able to enter the inter-collegiate schedule, but unless the laws of the present game suffer some radical changes before that time we will have even less than our customary amount of foot ball.

THE RUNNING TRACK.

For some time arrangements have been quietly going on, whereby a quarter mile running track might be put in on the campus. At the last meeting of the Board of Directors of the Athletic Association it was decided that Dr. Mees be requested to report to the Board of Trustees of the Institute that the Association desired their permission and co-operation in putting in such a track, at the same time naming the amount the Association was willing to contribute as their share of the expense. We have since been informed by Dr. Mees that the desired permission has been granted by the Trustees, and the work of building will begin at once. As stated above, the track is to be a quarter of a mile in length and is to be built of cinders and banked, so that it may be used by runners and bicyclists, alike. It is necessary that it be completed as soon as possible, in order that it may receive the full benefit of the winter rains and freezes, which are so essential toward settling it. This track will fill a long felt want, with runners, especially, and we are sure they will heartily appreciate this concession of the Trustees.

BASE BALL.

At the last meeting of the directors of the Athletic Association, a committee was appointed to canvass the school for possible material for a base ball nine for the coming season.

This committee had a meeting recently and roughly outlined a plan of work preparatory to the opening of the season.

As is well known, our battery is our weak point, as neither Stewart nor Brinker, who filled the positions last year, are members of the Institute this year, and it is not known that there are any candidates for the positions in the Freshman class. For this reason the committee has decided

to manufacture a battery. Darst has been selected for catcher and with practice we believe he will develop into a good one. Three or four possible pitchers will be selected and practiced as thoroughly as the amount of spare time will permit, it being the idea of the committee to spend several hours each week in practice, in the basement if it can be so arranged, in order that all who may be candidates for this position may be in fairly good trim by the time the weather becomes favorable to outdoor practice. At that time a second nine will be selected with a man in charge who is sufficiently interested in the success of the first team to have his men out whenever it is possible.

The committee hopes to be able to make arrangements to have at least three days in every week in which they will have not less than an hour of practice, at which time every man will be required to be on hand.

It is to be seen that the committee is profiting by last year's experience, at which time preparatory practice was put off too long, with the result that we lost the first games of the season and it was only toward the last that we became aware of the good material we had in our nine.

Let us devote all our efforts toward making this year's nine at least a thoroughly practiced one, and no doubt the results will be entirely different from those of the football season.

W. I. C. A. A. FIELD DAY.

The Field Day of the Western Inter-Collegiate Athletic Association, which is to be held here in May will be an event of unusual interest.

Readers or THE TECHNIC will remember the letter in the November number from Prest. Burk of the association, in which he gave a brief history of its growth and object, and all were no doubt impressed with the importance of such an organization.

Now that Rose has secured this next meet, nothing should be left undone by the members of the Institute that will aid in making it a success.

Prest. Burk has already at this early date received letters from some of the colleges of the association informing him of their preparation for the contest, and assuring him of their intention of being on hand in full force.

A number of these colleges contain athletic material that is superior to any that has been seen at the Indiana Inter-Collegiate Field Day contests and for this reason an unusually interesting time is promised.

POLY GYMNASIUM CLASS.

Those members of the Institute who have desired to enter the gymnasium class at the Y. M. C. A. but have not done so heretofore, should take advantage of the opportunity offered to join the special class that is to be organized this month.

Such a course, as is very well known, is of great value to every one, but it will prove particularly beneficial to those who intend taking a prominent part in athletics in the spring, and it will go farther toward getting them into condition than several weeks of really hard training just previous to a contest. It is the man who trains steadily and regularly, and not the one who does it by spells, that obtains the best results.

There is a special rate for a six month's membership and those joining now will have all the privileges of the institution in addition to the class training.

THE FOOT BALL PICTURE.

When it was recently announced that the pictures of the foot ball team were out and about the the same time there appeared on the bulletin board a photo-engraving of a group of players, labeled "R. P. I. Foot Ball Team," all the students rushed up to it for an examination, only to turn away with expressions of disappointment, at the same time remembering there is another R. P. I. The announcement was true, however, there being a number of bona fide photos of the Rose team in possession of the various students. The picture is excellent, being quite large and the likenesses are all good. The grouping was also very good, the smaller men occupying the positions in the foreground and the larger ones standing

back of them. The players are flanked by manager Robinson and coach Walker.

NOTES AND CLIPPINGS.

The Cornell Boating Crew, which is conceded to be the best collegiate crew in America, is to visit Great Britain this year, and they are very hopeful of gratifying results. The Britishers seem highly pleased over their prospective visit and promise them a royal good time.

Franklin's Field, University of Pennsylvania's new athletic grounds, will be finished this year. This is said to be the most perfectly appointed and best arranged college athletic field in America and we can well believe it from the description contained in the *University Courier*. Pennsylvania is to be congratulated upon the successful completion of this great institution.

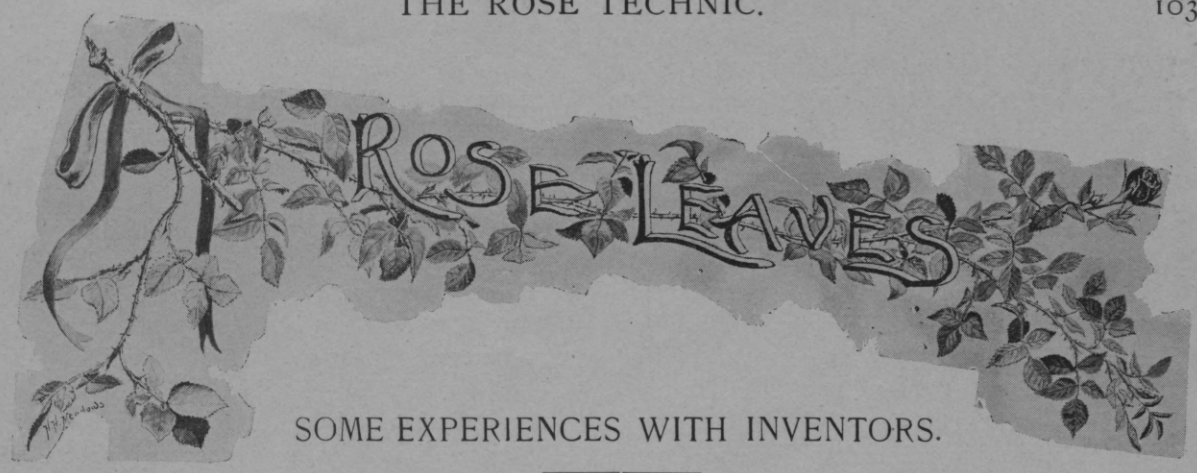
Though the foot ball season is usually considered over with the Thinksgiving Day games, there were two very interesting games played after that time between the University of Chicago and Stanford University. The first game occurred in San Francisco, on Christmas Day, the Chicago's winning, 24 to 4. Los Angeles was the scene of the second encounter, at which time the result of the former game was reversed, Chicago being shut out, 12 to 0.

We make the following clippings concerning the W. I. C. A. A.:

INTER-STATE ATHLETICS.—President Cubbins, of the Athletic Association of Center College, has received a letter from the Secretary of the Western Collegiate Athletic Association, asking him if Center College would agree to represent Kentucky by membership in the organization. The association includes ten states, reaching from Ohio to Colorado, and the fact that Center has been selected from the other Kentucky Colleges to represent this Commonwealth is a complimentary recognition of her standing. The next field day exhibition of the association will be held on the famous "Nancy Hanks Track," at Terre Haute, Ind., in the coming month of May. Dr. Young has the question under advisement and it is highly probable that Center will compete for some of the handsome medals that will be "hung up" at Terre Haute. There is some very fine material in college this year and Prof. Flattery will no doubt bring every inch of it into working order. Center could win her share of the medals, and such a participation in a national affair would be a fine advertisement.—*Danville (Ky.) Advocate.*

The management of the University of Illinois track team has secured the services of Harry Cornish, manager of the Chicago Athletic Club, to coach the members. Mr. Cornish will be with the men twice a week up to May 1st, when he will take full charge of the team in order to get the men in good shape for the Western Intercollegiate Association meet, which will be held at Terre Haute, Ind., under the auspices of the Athletic Association of Rose Polytechnic, and for the big college meet in Chicago. The engagement of Harry Cornish means that Illinois intends to do her best to retain the Western athletic championship, which was so handsomely won at Chicago last June.—*St. Louis Despatch.*

He was quite a philosopher in his way,
  He prided himself on his knowledge of faces.
But he swore when he found that his opponent's phiz
  Instead of a pair meant four aces.



SOME EXPERIENCES WITH INVENTORS.

Unfortunately, it is not always the inventor who gains the credit or reaps the fruit of his invention. A mechanical success is not always a commercial success. To be a successful inventor one requires money back of his ideas, and naturally the most successful are those who are their own capitalists.

I have just completed my first year of practice with the inventor, and find it a field of most varied experiences. In the office of a patent solicitor we have to deal with every known trade or art, and a good many unknown ones. A man who is unable to draw or construct a model will come in, and it falls to my lot to assist him as much as possible by making drawings from his description and putting the parts together into an operative combination. We often strike men of good mechanical ability, and others with technical knowledge, yet a large majority of the so-called inventors are uneducated in theoretical or practical mechanics. The field in electricity has been a very interesting one and brings one into contact with men at the top of their profession. The most interesting series of inventions with which I have had to deal this year has been those of the Electrician Card, of the Card Electric Co., of Mansfield, Ohio. Mr. Card has devoted himself this year to the development of street car systems and electric hoisting machinery, and a great many difficulties in the present system have been obviated. As at present arranged the motor of a car is in a very exposed position. Mr. Card has designed a water tight motor, everything being protected by a casing which partly forms the field of the machine. The motor can be run through water or snow without injury to any of its parts, or danger of burning out.

Another difficulty met with in the street car system has been in providing suitable means for controlling the current on the car, the principal defect being proper means for throwing in and out resistance without sparking or short circuiting. The Card controller is provided with a series of snap switches which control the resistance in the car circuit. The cut out switches consists of a lever, pivoted to a suitable support, and carrying at one end a grip contact piece, and being bifurcated at the other end. A coil spring is fastened to the forward end of the lever, and is carried back past the pivot and fastened to the pivoting block. When the two ends of the spring are in line with the pivot the lever will be held in a given position; but as soon as the lever is moved so as to carry the spring out of line with the pivot, the spring, in contracting, throws the lever up or down, as the case may be, and "makes" or "breaks" the circuit, A cam, operated by the hand lever between the bifurcations, throws the lever so as to carry the spring past the pivot in either direction, and the spring completes the movement of the lever, thus causing an instantaneous "make" or "break." A series of these levers are connected with a resistance box, and by properly manipulating them the current, which goes to the motor, is governed.

The Card pneumatic switch is also a very useful device, which prevents the burning out of the line by having an arc follow the disengaging contact of a cut out.

Since the expiration of the Bell Foundation Patent, last May, the telephone business has been given a great impetus, and companies have sprung up all over the United States. The Anthony Company, of this city, have built up a thriving business in this line, and they hold as one of their principal patents, the invention of M. O. Anthony, on a telephone transmitter of the carbon pencil type. Heretofore in this class of transmitters, an annoying buzzing and burring has been encountered. By a series of quite extensive experiments Mr. Anthony discovered that this burring was due to the revolving of the pencils in their bearings. His invention consists in placing locking pencils between alternate or opposite pencils and thus preventing this rotation, practically doing away with all buzzing and burring.

A few weeks ago in the United States Circuit Court, Judge Carpenter, held the Berliner patent on telephones void. The Bell company, who control this patent, have an appeal from the decision of this court, but nevertheless many companies will go into the manufacture of this telephone. It may be interesting to some to know that the ground upon which this patent was held void was substantially this: The application was filed in 1877 and not issued until 1891, the appliance being used in the meantime and the company intentionally delaying the issue in order to have the monopoly of the telephone business for a greater number of years; moreover, the same system was known and described in 1880 in a prior patent.

Outside the field of electricity the novelty or toy seems to stand on a parallel with the car coupler. Many neat and novel mechanical toys have been brought to my notice this year, such as a toy which will turn a hand-spring; another, a back-flip; numerous climbing and walking toys, etc. Next to the toy comes the car coupler. Congress has passed a law providing that all railroad companies should adopt an automatic coupler. At the present time there are 15,000 patents in this class, and new ones coming out every week.

Among the ludicrous things which have come under my observation was an "inventor" who had discovered that there was a given ratio between the length of the arms of a lever, and he intended to put this to a practical use in shaping objects from a pattern, making them larger or smaller as he moved his pivoting point, still maintaining the same contour. He was very much surprised when I showed him that he had "discovered" a very old principle.

Another man had been reading of several safe robberies and had devised a scheme for preventing such occurrences. His idea was to fasten to the floor in front of the safe a large copper plate and suspend another above the safe; these were to be the terminals of an electric circuit, and as the burglar touched the combination the upper plate was to fall, complete the circuit with the burglar in it, and roast him alive. He said that a friend had asked him "what would happen if the burglar wore rubber boots," and he told him that the current should be strong enough to melt the rubber. He wanted my advice as to its practicability. To satisfy him, I told him that a practical test would be the best thing to bring out defects, if any, but he was afraid that he could not get any one to risk his life for the benefit of science.

The perpetual motion men are not all dead. One man, a fair mechanic, proposed constructing two archimedes screws, one having four turns while the other had three turns; he placed these at an angle to the perpendicular, connected their lower ends by a trough, and their upper ends likewise. The two were geared together, and by placing several balls above the screw having four turns and several below the screw having three turns, then starting a ball down the former screw, it would revolve it, and through the connecting gearing the other screw. When the first ball was three-fourths of the way down, one lower ball would have been raised and deposited above the first screw ready to descend. He therefore figured that the fall of the first ball the remaining one-fourth would generate power which he could utilize.

A model was necessary to convince him that it

wouldn't work, and still he was not convinced.

There is a demand and opportunity for what may be termed "an inventor's assistant," and if more young men with a technical education would devote themselves to this line, I am convinced that the style and class of invention would not be as crude as a great deal of it is at present.

E. K. Hood, Ex-'96.

Cincinnati, Ohio, Jan. 8th, '95.

The Seniors handed in their subjects for theses on Saturday, the 12th, and the following have been decided upon:

Darst, Brown and Crowe—The Terre Haute Electric Lighting Plant.

Craver and McTaggart—The Heating Power of Indiana Coals.

Mundy, Speed and Troxler—The Louisville Electric Railway System.

Robinson, Anderson and Miller—The 500 H.P. Engine and Generators of the People's Electric Light Company, Terre Haute.

Wiggins, Shaneberger and Crockwell—Design of Steel Arch at Rochester, N. Y. Crockwell, fixed arch; Shaneberger, two-hinge arch; Wiggins, three-hinge arch.

Burtis and Tuller—Lighting Plant at Milford, Ill.

The others have not yet been decided. Several changes have been made with regard to the thesis work this year. Each student first writes his own thesis and receives a mark on it before the work of two or three on the same subject is put together; then an oral examination will be held, which any one who wishes may attend. Four weeks is the allotted time for thesis work, instead of five as formerly, and the thesis work will count 20 per cent. in the year's mark.

At the last meeting of the Scientific Society a paper was read by W. D. Wiggins upon the construction of a suspension bridge across North river in New York. This is to be the longest suspension bridge in the world; the span between the two piers is to be 6,100 feet. The height of the two towers will be 620 feet, and taken altogether it will be an immense structure, costing some $40,000,000. After the reading of the paper, the discussion was led by Professor Howe, and proved to be an interesting one in which almost all present took part, and many points in the construction of the bridge to prevent vibrations, etc., were brought out. After the discussion of this paper, Professor Gray gave a short talk on transformers. The lateness of the hour prevented further discussion on this subject.

The attendance of the society has not yet become what it should be, and it is hoped that, hereafter, more will come out. The meetings so far have been quite interesting, and if the students will only take hold, they can be made much more so. At the next meeting which will be held on Friday, (Jan. 18th) a paper will be read by Anderson, Robinson and Miller upon the "Test of the Insulation of the Street Electric Railway." The students of the Sophomore and Freshman classes should bear it in mind, that they are always welcome to these meetings.

The meeting of the officers and executive committee of the Indiana College Press Association in Indianapolis on January 12th, proved to be quite interesting, and the action taken by the executive committee will be permanently beneficial to the welfare of the society. It has been found that no little difficulty is experienced each year in getting the association in working order, owing to the change in officers. An office of the association held by an editor devolves upon his successor to the position of editor, and often the new incumbent has never attended the meetings of the I. C.P. A., nor is he fully informed as to the functions of the organization. To obviate this difficulty the executive committee has arranged a program for the meeting in March such that two delegates will be required from each journal. The second delegate is to be chosen from those who will remain with the journal next year, so that at least one member of each staff will fully understand the relations of his own paper to those of other Indiana colleges. It is hoped that all the college pa-

pers of the state will send their representatives to the meeting on Oratorical Day, March 9th. Those not belonging to the association are cordially invited to join and should apply to the secretary for any information they may desire. Following are the officers present at the recent meeting:

H. H. Meadows, President, THE ROSE TECHNIC; James H. Cooper, Vice-president, *DePauw Weekly;* Chas. M. Gregg, Secretary, the *Wabash*. Miss Ida E. Mendenhall, *Earlhamite*, and Mr. George Hope, *Butler Collegian*, members of the executive committee. Mr. J. Edwin Jay also represented the *Earlhamite*.

RESOLUTIONS OF CONDOLENCE—CLASS OF '97 R. P. I.

WHEREAS, Mr. J. E. Lufkin, having been called home by the death of his dear mother, we, members of the class of '97, wish to express such tokens of sympathy as may come from friends and classmates; be it therefore

Resolved, That we tender to him and the bereaved family our most sincere expressions of condolence; be it also

Resolved, That a copy of these resolutions be furnished to THE ROSE TECHNIC.

COMMITTEE.

Light, who left Rose last year has returned and entered '96.

The Freshmen are one ahead of us in the way of receptions.

Gray, ex-'96, has obtained a position with the Big Four at Cleveland.

O'Brien, '96, spent the vacation with M. C. Andrews, '94 at the latter's home in State Line, Ind.

Burtis, '95, is now agent for Wright & Holloway, who have adopted a scheme of giving special rates to Polys.

It is reported that Long, ex-'93, now holds a position as Division Superintendent of one of the "Big Four" lines.

Junior—Are loud speaking telephones much used?

C. L. M.—Well, they are not a howling success.

The Juniors have no shop work this term, but devote four hours to laboratory work and have two lectures from Prof. Gray.

H. H. Meadows represented THE TECHNIC at the meeting of the Indiana College Press Association which was held in Indianapolis January 12.

O. E. Becker, who is attending the Ohio State University, spent his vacation in Terre Haute visiting friends. He was a member of '95 last year.

The ice on the pond east of the Fair Grounds was good before the recent snows, and several evenings found a goodly delegation of "Polys" among the skaters.

It looked as though the whole Institute took in "The Grand Vizier." There were Polys here, there and everywhere, and the general verdict was, "Good, come again."

Burk and Crowe went hunting a few days ago and brought back four rabbits. Every one in the Midway and several other ways now carries a rabbit foot in his pocket.

Prof. in Mechanics—You have here the velocity and the space, what is the time?

Class—Two minutes past six.

Prof.—Class excused.

Meadows, '96, has resigned his office as president of the orchestra, owing to the pressure of other work, and at a recent meeting Ingle, '97, was chosen to fill the office.

A number of enterprising Polys hastily made arrangements for a dance at Duenweg's Hall on Thursday evening after the exams were over. A long program of dances was enjoyed by all present.

One of our Alabama members was fortunate enough to enjoy a sleigh ride on the day he left home for Terre Haute; at least that was the explanation he gave for his mud bespattered shirt front when he met the boys at the station.

Miller and Failey met with an accident while sleighriding with two young ladies a few days ago; the small boy with the sled frightened the horses, and the whole party were dumped into the soft snow. Fortunately no one was seriously hurt.

Mr. McCormick and Miss Floy Magwire, of Hutchinson, Kan., were married on Christmas eve at the residence of the bride's uncle in Terre Haute. It was a quiet wedding, and after a pleasant trip to Chicago they returned to Terre Haute and are located at 1001 N. Ninth. With our hearty congratulations we wish them many happy returns of Christmas eve.

Hunt, '96, spent part of the vacation in Washington, D. C., as a delegate to the convention of the Alpha Tau Omega Fraternity, mixing business with pleasure he had a general good time, attending the reception given the convention by President Cleveland. He says the president seemed constantly worried, and was suffering from gout, but notwithstanding this proved himself a very genial host.

Professor Hathaway has revised his note book on quaternions, and it will be ready for the use of the Sophomore class by the middle of the month. We hope the "Sophs" will enjoy quaternions and apply them as constantly in analytics as the preceding classes have done.

Mr. Simon has introduced the study of the German laugh into the course in language. He has decided to give the sophomores ten minutes of each recitation to devote to this interesting topic and the remainder of the time will be occupied by attending strictly to the reading of German.

Prof.—"How would you find the velocity of a clock's hands, given the diameter of the face?"

"Sophomore Civil—"The hour hand goes around once an hour, the minute hand once a minute and the second hand ——.

But the pace was too lively and he couldn't finish.

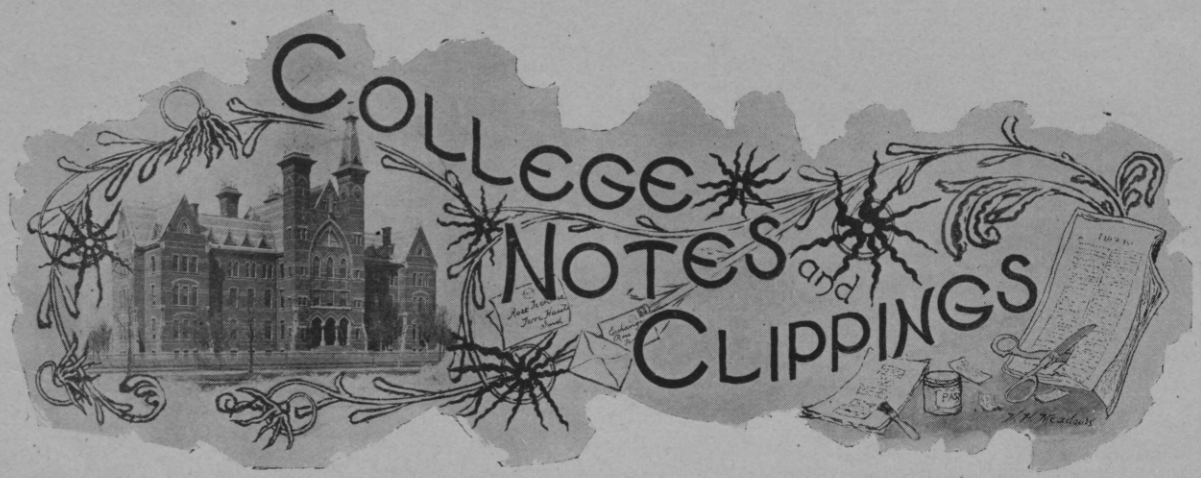
Certainly the approach of examinations is very depressing to the spirit of the Poly, but we are surprised that it should have been the cause of o'er clouding Austin's genial countenance. The picture of the foot ball team, which was taken before Xmas reveals the startling fact that he did not wear his usual smile.

On account of both the quantity and quality in the solid form of that which causes the milkmen to be subject to the income tax law and furnishes for the Terre Haute boarding houses such indispensable sustenance in animal and vegetable compounds, a majority of the Polys have enjoyed several evenings on skates recently.

The camera club, which has been talked of for some time was organized on the second Saturday of this month, with a membership of eleven. O. E. McMeans was elected president and Prof. Ames secretary and treasurer. The club has secured a room, lockers, etc., in the basement, and will soon have every arrangement for developing, printing, etc. for the convenience of those of its members who have not such facilities at their rooms. The object of course is much the same as that of similar organization in other colleges. One of its plans is to choose each

month a certain object or landscape, which each member shall photograph and work up; the best work to be decided by a vote of the club and preserved.

There are not a few agents for drawing instruments in the field this term, and those wishing to invest will probably be bewildered in choosing from so many excellent makes. An instance of this happened recently when a member of the Freshman class, after carefully inspecting the dividers, bow-pens, etc., of a certain set, asked to see the altenader (tor). Unfortunately none of the agents are handling either alternators or transformers.



The course in the Yale law school has been extended from two to three years.

A two hours course is offered in newspaper work to members of the Freshman and Sophomore classes of the U. of Pa.—*Ex.*

THE LAWYER DIED.

It was the lawyer's turn to speak—
He said as from the bench he sprang;
"Your honor, this man stole a horse
And therefore mustang."—*University Courier.*

Four million dollars have been donated to the new American University at Washington, besides a site given by the city equal to five hundred thousand dollars.

Presdent Smart of Purdue, has sent letters to the presidents of Minnesota, Wisconsin, Chicago, Northwestern and Lake Forest Universities asking for a conference on college athletics looking to the elimination of professionalism.—*DePauw Weekly.*

We leaned across the friendly stile,
The gentle moonbeam lit her face;
The sweet influence of her smile
Annihilated time and space.

Quoth I: "The breezes kiss your cheek;
O happy, happy breezes they!"
Sighed she, this maiden so petite,
"Who gave them a monopoly?"

—*Bowdoin Orient.*

With the reconstruction of the college campus this year Yale is to get a new official in the person of a college porter, for whom a lodge is in process of erection with a proper orifice in its wall, from which its occupant can inspect all candidates for admission to the college precincts and determine whether or not to let them in.—*Ex.*

Yale has lately been provided with cottages to which students will be sent in case of sickness. Such a move would be wise for all colleges which are situated in smaller towns and places where regular hospitals are not available.

Whenever they say "It rains cats and dogs,"
I always wonder whether
It wouldn't be quite correct to say,
"We're having beastly weather."—*Ex.*

The exercises of commencement day at Yale have been thoroughly revised. There will be no valedictory or salutatory addresses. A new officer called the orator will be introduced whose duty it is to present the various candidates for degrees to the president.—*Ex.*

In Latin and Greek
He was quick as a streak;
In dress he was foppish and tony.
The latter was due to his being an ass,
The former was due to his pony.—*Ex.*

The following are the demands of President Elliot, of Harvard, with regard to foot ball: exclusion of Freshmen from collegiate contests, confinement of all games to college grounds, exclusion of professional students from all intercollegiate contests, the revision of football rules to obviate violent collisions, and the prevention of intercollegiate contests in any one spot for two consecutive years.—*Student Life.*

The student sweetly sleeps,
When out upon the frosty morning air
The chapel bell its wild alarum rings;
Behold him now arising from his lair,
His acts being seven stages. First, a snort,
As peacefully he turns over for a doze,
Until the morning sunbeams fall athwart
His face. And springing out he stubs his toes
Cursing and groaning then with shoes half on,
He hears outside the sound of hurrying feet;
In desperation grasps the pitcher, looks inside, all gone!
Ye gods! His room-mate he consigns to eternal heat
Then hies to breakfast; sits down out of breath; but hear!
The bell! he flies, leaves food untasted on the plate.
Now on his way but not with humble mien, I fear.
Sans wash, sans breakfast, books, and everything too late.—*Miami Student.*

The directors of Washington University have decided that the location of the University is to be moved farther west in St. Louis. A tract of land lying northwest of Forest Park, has been selected and purchased conditionally. The new buildings decided on are: a main building, chemistry, mining, gymnasium, dormitories and library.—*Student Life.*

OLD SHOES.

How much a man is like old shoes;
For instance, both a soul may lose;
Both have been tanned; both are made tight
By cobblers; both get left and right;
Both need a mate to be complete,
And both are made to go on feet.
They both need healing; oft are sold;
And both in time turn all to mold.
With shoes the last is first; with men
The first shall be the last; and when
The shoes wear out they're mended new;
When men wear out they're men-dead, too.
They both are trod upon, and both
Will tread on others, nothing loth.
Both have their ties, and both incline
When polished in the world to shine;
And both peg out—and would you choose
To be a man or be his shoes? —*Graphic.*

The Honor System at Lehigh is now an established fact, the constitution governing its enactment having been accepted by the faculty. The Student Court will consist of ten members chosen from the four classes. Its scope is limited to the investigation of cases of fraud in university work. Where guilt is established the court has power to recommend the proper punishment of the offender to the faculty of the university, but the court possesses the discretionary right, particularly for the first offense, to reprimand the offender without reporting to the faculty. When sitting as a court, six votes are requisite to render a decision, but in other cases a majority decides. —*Daily Princetonian.*