

The

W. P. I.



Vol. XI.

Saturday, October 26, 1895.

No. 8.

CONTENTS.

	PAGE		PAGE
Editorials	99	Rambler	111
Proportional Representation	100	Meeting of the Class of '99.....	111
Rise and Decline of Natural Gas Fuel.	103	A Distinguished Visitor	111
Mass Meeting in the Chapel	107	Dr. Mendenhall at Atlanta.....	112
W. P. I. vs. N. A. A.	108	Shop Notes	112
Second Eleven vs. Leominsters	108	Technicalities	112
First Cross-Country Run	109	Alumni Notes	112
N. E. A. A. U. Championship Games.	109	College Notes	113
Washburn Engineering Society.....	110		

WORCESTER, MASS.

THE WORCESTER POLYTECHNIC INSTITUTE.

Chas. Hamilton, Printer.

Why not call on

BRUCE & CHAPIN

before you buy anything in the

JEWELRY LINE?

We should like to repair your watches when they need it, at very reasonable rates.

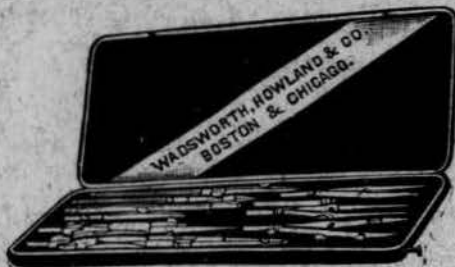
BRUCE & CHAPIN,
330 MAIN STREET.

Special Discount to W. P. I. Students.

S. I. HOWARD, CARPENTER AND BUILDER,

Estimates furnished on all kinds of work. Store Fronts in Heavy Brick, Stone, or Iron Buildings a Specialty.

RESIDENCE 63 MAIN ST.,
WORCESTER, MASS.



TECH STUDENTS SHOULD KNOW

THAT OUR STOCK OF

DRAFTING INSTRUMENTS AND MATERIALS

IS THE LARGEST IN NEW ENGLAND.

THAT THE QUALITY OF OUR GOODS IS THE BEST
THEY ADMIT

WHEN THEY SEE THEM.

ILLUSTRATED CATALOGUE MAILED FREE.

WADSWORTH, HOWLAND & CO.,

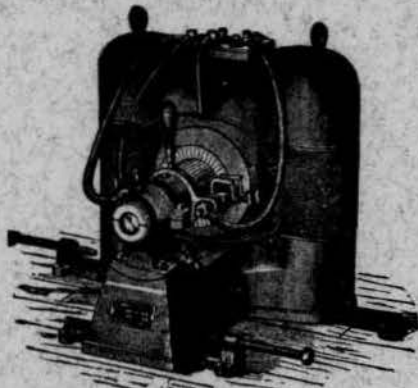
82 & 84 WASHINGTON ST., BOSTON.

J. P. COGHLAN.

F. E. GILBERT.

COLUMBIA ELECTRIC CO.

J. P. COGHLAN, '93, Manager.



THE "COLUMBIA" DYNAMO.

MANUFACTURERS OF

DYNAMOS and MOTORS.

Dealers in General Electric Supplies.

Special Prices to Tech students. Come in and see us.

Offices, 339 Main Street,

Factory, 180 Union Street,

WORCESTER, MASS.

INSTITUTE DIRECTORY.

SENIOR CLASS.

President, R. S. Riley; Vice-President, C. F. Vaughn; Secretary, J. W. Higgins; Treasurer, H. T. McClure.

JUNIOR CLASS.

President, E. L. Walker; Vice-President, C. F. Day; Secretary, E. E. Pease; Treasurer, J. G. Keyes; Historian, W. W. Braman.

SOPHOMORE CLASS.

President, R. R. Smith; Vice-President, W. H. Perkins; Secretary, W. C. Fuller; Treasurer, A. O. Hitchcock.

FRESHMAN CLASS.

CURRENT TOPICS CLUB.

President, A. W. Clement, '95; Vice-President, C. C. Chalfant, '97; Secretary and Treasurer, H. H. Morse, '97; Executive Committee, The Officers and Profs. Cutler and Haynes.

TENNIS ASSOCIATION.

President, H. J. Fuller, '95; Vice-President, Phillip Goodrich, '96; Secretary and Treasurer, G. O. Sanford, '95.

CAMERA CLUB.

President, H. J. Fuller, '95; Vice-President, A. L. Smith, '90; Secretary and Treasurer, J. W. Higgins, '96.

Y. M. C. A.

President, J. W. Higgins, '96; Vice-President, E. H. Willmarth, '97; Corresponding Secretary, E. G. Beckwith, '97; Recording Secretary, W. B. Bingham, '98; Treasurer, A. T. Fuller, '98.

W. E. SOCIETY.

President, A. W. Clement; 1st Vice-President, Prof. W. W. Bird; 2nd Vice-President, P. B. Morgan, '90; 3rd Vice-President, A. D. Butterfield, '93; 4th Vice-President, C. D. Parker, '79; 5th Vice-President, R. H. Taylor, '95; Secretary, Prof. G. I. Alden; Treasurer, W. F. Cole, '83; Counsellors, Dr. E. H. Bigelow, '75; F. H. Whitney, '71; S. M. Green, '85; W. V. Lowe, '81; W. T. Hatch, '73.

ATHLETIC ASSOCIATION.

President, F. W. Parks, '96; Vice-President, O. W. Lundgren, '97; Secretary, H. M. Warren, '96; Treasurer, R. S. Riley, '96; Keeper, E. G. Beckwith, '97; Board of Directors, C. F. Vaughn, '96, C. F. Day, '97, A. O. Hitchcock, '98.



SPEIRS MFG. CO.
 DEALERS IN
BICYCLES, ATHLETIC AND SPORTING GOODS.
 MANUFACTURERS OF
 Speirs and Majestic Bicycles, Club Outfitters, Emblems, Etc.
 279 MAIN STREET, BAY STATE HOUSE BLOCK.
 Telephone, 336-3. LINCOLN HOLLAND, Manager.

LOVELL ARMS AND CYCLE CO.

Offer **SPECIAL DISCOUNTS** to members of the W. P. I. on everything in the line of
BASEBALL, FOOTBALL & GENERAL ATHLETIC GOODS.
Running Shoes, Sweaters, &c.
HEADQUARTERS FOR LOVELL DIAMOND BICYCLES,
 Corner Main and Foster Streets.
GEORGE S. DAVIS, Manager.



MESSENGER & JONES,
HIGH CLASS TAILORS,
 388 WASHINGTON STREET, BOSTON.
STUDENT WORK A SPECIALTY.

Mr. Carroll, formerly of Worcester, has connected himself with us and will now attend to your interests.



LUD C. HAVENER,
BICYCLES,
ATHLETIC GOODS,
 CLOTHING, SHOES FOR SPRINTING, ETC., ETC.
 Outfitters to W. P. I. CLUBS.
507 MAIN STREET.

THIS SPACE TO LET.

CHAS. HAMILTON,
 BOOK, JOB, CARD,
 POSTER,
 AND NEWSPAPER } **PRINTER.**
 No. 311 Main Street, Worcester, Mass.

DON'T LET

The Dress Suit Question worry you. Come to us, we'll fix you all right.

Dress Suits to Measure, } Prices
 " " Ready-Made, } Reasonable.
 " " To Let.

Our Custom Work second to none.

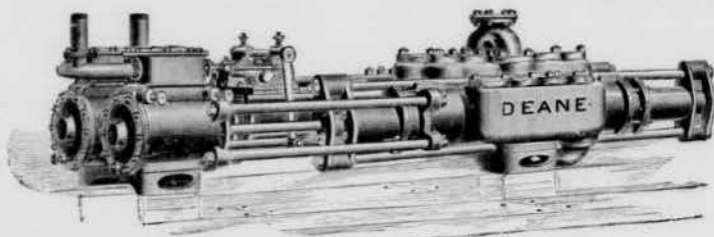
ASK FOR THE TECH DISCOUNT.

286 Main Street.

DAVIS & CO.

THE DEANE OF HOLYOKE.

STEAM
PUMPS.



POWER
PUMPS.

The DEANE STEAM PUMP CO., - HOLYOKE, MASS.
 New York, Boston, Philadelphia, Chicago. Catalogues upon application.

15	THE ▲	25
BEST	HOLDEN	PER CENT.
CABINETS,	411-MAIN-ST. 411	DISCOUNT
\$3.00.	WORCESTER,	TO TECHS.
	- MASS.	



WE DO LARGE WORK UP TO 18 X 22.
LARGE GROUPS A SPECIALTY.

REMEMBER
 No. 18 Pearl Street, opp. P. O.

Is Geo. Y. Lancaster Ticket Agency,

There you will find the Travellers' Headquarters for Worcester County.

For all kinds of Railroad and Steamship Tickets, Drafts, Foreign Money, Letters of Credit, Passports, Etc. Also, Accident, Life and Fire Insurance.

The nicest, cleanest, and most reliable Agency in this vicinity.
 Your patronage is respectfully solicited.

Remember, 18 Pearl St., opp. P. O.

ARTHUR W. RICE.

HARRY B. HOPSON.

ARTHUR W. RICE & COMPANY, Opticians,

39 PLEASANT STREET, WORCESTER, MASS.

Artificial Eyes.

Opera, Field and Marine Glasses.

Thermometers.

Optical Repairing.

OCULISTS' FORMULÆ FILLED IN OUR OWN WORKSHOP.



Vol. XI.

WORCESTER, OCTOBER 26, 1895.

No. 8.

Board of Editors:

JOHN WEAKLEY CHALFANT, Jr., '96, Editor-in-Chief.

HORACE CARPENTER, '96, Business Manager.

HARRY ELWELL WHEELER, '97, Assistant Editor.

LLOYD JEWETT DAVIS, '97, Assistant Business Manager.

FRANK ERNEST KNOWLES, '96.

CHARLES FRANCIS LEONARD, '96.

HOWARD SPRAGUE KNOWLTON, '98.

ASSOCIATES:

HERBERT HARRINGTON MORSE, '97.

LAWRENCE POWERS TOLMAN, '97.

ARTHUR ATWATER KENT, '99.

The W P I is published by the students of the Worcester Polytechnic Institute on alternate Saturdays during the Institute year. Items of interest are requested from students and alumni of the Institute. All matter must be accompanied by the name of the writer. Subscribers who do not receive their paper regularly, or who make any change of address, will confer a favor by immediately notifying the Business Manager.

Subscription Price is \$1.50 Per Annum in advance. Remittance preferred by Money Order or Cash.

Remittances and communications pertaining to business should be addressed to the Business Manager. Address all other communications to the Editor-in-Chief.

Entered at the Post-Office in Worcester, Mass., as second-class matter.

To one who attended the meeting of the Athletic Association several weeks ago, the spectacle of October twelfth seemed almost as a miracle. Four weeks ago who would have thought that three hundred dollars could be raised at the Institute within thirty minutes? Who would have thought such a thing possible from the students? One week hardly enough men could be had for a quorum, the next week the chapel is filled to overflowing with men willing and able to help athletics.

We are glad, nay, we are more than that, we are jubilant over the mass meeting. October twelfth, as Prof. Coombs said, certainly marks a turning-point in athletics long to be remembered. Some day in the future we will see in these columns mention of this mass meeting as the one thing which

has brought Worcester Tech to the position she holds on the athletic field.

In our exultation we must not, however, forget those who are responsible for it. We owe to the ringleaders of the above affair more credit than we can give, and all students should be mindful of this and act accordingly. To Prof. Coombs, especially, should we be grateful, for his stirring and earnest words were responsible for many of the five and one dollar bills.

Now that we have all subscribed our mite for the year 'ninety-five-'ninety-six let us be up and doing in everything. Let us each endeavor to outstrip the other in pushing Tech to the position she rightly should hold. To those men who each night practice hard and faithfully to win honors for us on the

football field, the following words do not apply; but for those who can and do not play our words are meant, and we hope they will make them feel their own selfishness.

We have repeatedly urged upon the students the necessity of a second eleven. Not only is it necessary that we should have a second eleven to play with preparatory schools, but also for a still more important reason,—we should have one to line up against our 'Varsity. No matter how proficient our 'Varsity may be in signals, goal kicking and like things, if it does not practice constantly with another team it can avail us little. Then the men who can play, but who will not for trifling reasons, should turn over a new leaf. They should throw over their selfish inclinations and do their best for the Institute. Can you expect the students to give money when it is not appreciated? The students have given their money so you must show you are worthy of it. Go out all of you, play as you never played before, give the 'Varsity some real hard practice. Practice, and that severe, is what our football team needs now. Give the men this and they will finish the season even better than it was begun.

The lectures of Postmaster J. Evarts Greene to the Senior Class on "Proportional Representation" were exceedingly interesting. Mr. Greene has sent us the copy of his first lecture, which we publish in this issue. In our next number we hope to give his second lecture.

We are especially grateful to Mr. Greene because he has taken the trouble to revise his remarks entirely and to insert much of that part of his discourse, which was given entirely without notes. This required much time at least and we take this opportunity to express our appreciation of his kindness.

The remarks of Mr. Aldrich, at the last meeting of the Washburn Engineering So-

ciety, concerning Natural Gas, led us to believe that an article on this subject would be of decided interest to our readers. Many persons have but a vague idea of this fuel and know but little of what it has done for the manufacturing interests of the country.

In view of the above and because we think many of the students will take interest in reading it, we print in this issue an article on Natural Gas. We are indebted to the *Pittsburgh Times* for its able article on this subject, but owing to lack of space we cannot publish it in full.

Owing to the fact that the transactions of the Washburn Engineering Society were carried on without notes, we are unable to give in detail in this issue the remarks of Mr. Aldrich on the gas engine. Mr. Aldrich has, however, very kindly consented to write for us an article on this subject and we hope in the very near future to present it to our readers.

PROPORTIONAL REPRESENTATION.

A Lecture Delivered to the Senior Class by Postmaster J. Evarts Greene, October 14th.

Gentlemen of the Senior Class:—I cheerfully accepted from your president and professor the honor of an invitation to address you on the subject of Proportional Representation because the subject seems to me of fundamental importance, and because proposals for political reforms can be presented with special confidence in their favorable reception, if they merit it, to an audience composed of young men whose present studies and probable future employments enlist them in the ranks of progress. Science and its applications are your study now and will occupy the energies of most of you during all your lives. Science implies progress; the practical application of science to the objects of human desire, implies enterprise and invention, willingness to accept and readiness to devise new things. For this reason I can more hopefully present my thoughts on this subject to you than to students of law or theology, whose studies tend to produce or confirm a conservative habit of mind.

In treating my subject, I propose in the hour allowed me to-day, to define what I mean by "Proportional," or, as it might be styled, "actual representation"; to show how widely our present systems of so called representation have diverged from it; and to consider briefly some of the schemes proposed for attaining or approaching it. In the hour kindly assigned to me to-morrow I hope to discuss further these plans of reform, to explain as fully as my time will permit that which I believe to be the best of them, and to show how it will correct or cut

up by the roots many of the evils inseparable from our present system of representation.

Proportional or actual representation is that form of representation in which every political element of the constituent body appears in its true proportions in the representative body. Absolutely exact representation within the terms of this definition is of course impossible. The town-meeting is a pure democracy, composed of all the legal voters of the town, so far as they choose to be present; and each man speaks and acts in his own individual right. Exact representation would require that each political crank and each group of two or three voters, bound together by personal prejudices or interests, should be represented, as well as the great parties, and each in its due proportions. That is to say, the representative and the constituent body must be identical. Exact representation being, therefore, impracticable, any actual representation must be imperfect; but it will approach perfection as we get nearer to this standard, or the more nearly we make the representative body a copy in little of the constituent body, containing all its political elements in their due proportions. It seems to me axiomatic that our election systems should be so contrived as to approach this ideal as nearly as practicable. I know that many men, much my superiors in ability and in political knowledge and experience, disagree with me in this. I cannot in the time allowed me discuss this point, but must leave it with the statement of my own conviction.

All our elective officers are in a sense representatives. The governor, the mayor and the sheriff represent the executive and administrative authority of the people; the legislature and the city council exercise by representation its legislative authority. The governor representing all the people of the State, the mayor all the people of the city, the sheriff all the people of the county, each holding an office whose nature requires that all its authority should be exercised by one person, are or should be elected by a majority, thus representing the constituency as nearly as one person can. In fact, each is sometimes, and not seldom, elected by less than a majority; that is to say by a minority, the largest of three or more parties being often a minority of the constituency. I will suggest later how this evil might be remedied, though it scarcely comes within the scope of proportional representation as commonly understood.

The larger the number of persons to be elected on one ballot by one constituency, the more nearly exact representation can be approached; and conversely, the smaller the number of persons elected on one ballot, and the greater the number of districts, each electing its share of a fixed number of representatives, all composing one representative body, the wider is the divergence from it.

Confining myself for the present to representation in our legislative bodies, national and State, I will try to show briefly how far this so called representation is from being exact or even proportional, and why it may not unreasonably be styled fictitious or illusory.

1st. The members of these bodies are elected for the most part by single member districts. The representative of such a district should be, and doubtless generally is, elected by the votes of a majority of his constituents. But not always. In the last congress one representative from Massachusetts was elected by scarcely more than a third of the votes cast. In every house of representatives of Massachusetts, it is safe to say there are many members, each of

whom received fewer than one-half the votes cast in his district. It is commonly said, and as commonly believed, that in this country the majority rules. It is not true in theory, nor always in fact. If we should have, as might easily happen in the rise of a new party, three political parties nearly equal in voting strength, a great majority in congress and in our State legislature might be elected against the will, and in spite of the earnest effort, of nearly two-thirds of the voters.

2d. The voters of the smaller parties, that is to say those fewer in numbers in each district, are practically disfranchised, though they may be in the aggregate a majority; their right of suffrage is a formality or a delusion. They cannot hope to elect a representative. The result of the election will be precisely the same whether they vote or not, and they know it. It cannot be wholesome for the community that any considerable number of men in it should feel that they are practically without political rights, and have no part or influence in the government of their State or country.

General Garfield said in a speech in the house of representatives in 1870: "In my judgment it is the weak point in our theory of representative government as now organized and administered that a large portion of the people are permanently disfranchised. There are about thirty thousand democratic voters in my district, and they have been voting for the last forty years without any more hope of having a representative on this floor than of having one in the Commons of Great Britain."

3d. There is the evil expressed in the phrase "tyranny of the caucus." Government by party I believe to be desirable as well as necessary, and parties must choose their candidates. But I object to having a candidate, who may be personally objectionable forced upon me. I may have no confidence in his character or capacity; he may, while representing me fairly on one pending issue, wholly misrepresent me on others; he may, for example, be a protectionist and for free silver, while I am a protectionist and against free silver, but, since he is the party candidate, I must vote with my party against my principles, or some of them, for him, or against my party for some other candidate, or refrain from voting.

4th. Election by single member districts tends to subordinate the political to the personal element in representation. If the candidate of your party is a strong, fearless, and masterful man, somewhat lacking in tact and discretion of speech, who makes many enemies as well as devoted friends; and an opposing candidate is ready, convincing and persuasive of speech, and has a cheerful, cordial manner, the temptation to defeat and humiliate the man you dislike may overcome your desire for the success of your political principles. You may accept the plausible fallacy, "vote for the best man," careless or forgetful of the fact that the better and more personally influential the man may be, if his political ideas are not in accord with yours, the greater the power you give him to gain the ascendancy of his ideas and the overthrow of your own.

5th. The single member district system, especially, and indeed any district system without proportional representation, invites gerrymandering, an evil which prevails more or less whenever and wherever district apportionments are made under our present system.

6th. Bribery of voters is fostered by our present method of elections. It has never, I am proud to

believe, been common in Massachusetts, but the evidence of its prevalence in some other States is too strong to be doubted.

7th. Our present form of representation promotes instability of parties and of legislation. The change of a small percentage of the voters from one of the great parties to the other may change a two-thirds majority of one party in the representative body to a two-thirds majority of the opposing party. The victorious party, finding itself omnipotent, is tempted to extreme legislation, which in turn invites a popular reaction. A change of two or three per cent. of the voters will throw the close or doubtful districts alternately into one or the other scale, giving the deceptive show of a great revolution in public opinion.

General Garfield, in the same speech from which I have already quoted, said: "When I was first elected to congress, in 1862, the State of Ohio had a clear republican majority of about twenty-five thousand, but by the adjustment and distribution of political power in the State, there were fourteen democratic representatives upon this floor and only five republicans. The State that cast nearly two hundred and fifty thousand republican votes against two hundred and twenty-five thousand democratic votes, was represented in the proportion of five republicans and fourteen democrats. In the next congress there was no great political change in the popular vote of Ohio,—a change of only twenty thousand,—but the result was that seventeen republicans were sent here from Ohio, and only two democrats. We find that only so small a change as twenty thousand changed the representatives in congress from fourteen democrats and five republicans to seventeen republicans and two democrats. Now no man, whatever his politics, can justly defend a system that may in theory, and frequently does in practice, produce such results as these."

8th. While each district elects a representative who must be a resident of the district, the choice of the electors is unduly limited, and the service of a man whose ability is conspicuous and his willingness to serve the public is undoubted, may be lost because his political ideas are not acceptable to the majority in his district, though another would gladly be represented by him. A young man living in a district where his party is in the minority, having capacity and ambition for public life, finds all avenues closed to him. Even in his State, as in many of the Southern States now, his party may be hopelessly unable to elect a representative in congress. He must therefore forego his ambition, which may be a serious public loss, if his talents are great, or remove to another State where opportunities are open to him, or yield to the temptation to be false to his convictions in order to gratify his ambition.

9th. Small districts are, more readily than larger, controlled by small men and the petty intrigues of narrow and selfish politicians. "A prophet is not without honor save in his own country and in his father's house." A man of recognized eminence, willing to serve his district as its representative, but unwilling to solicit or intrigue for that service, has before now been rejected by his own party through envy or personal prejudice or the appeal of an aspirant, who pleads with men of his own kind that he should have the place, because it would be a great distinction to himself while it cannot be an object of serious desire to the other.

Having thus suggested some of the defects, as they seem to me, of our present system of representation

and their unfortunate results, actual or probable, we will now consider the reforms, or at least changes of the electoral system that have been proposed, and some of them adopted, to avoid or correct these evils.

1st. *The limited vote.* According to this method, the number of candidates to be elected being three or more, each elector may vote only for a smaller number. This method is that proposed by the legislature and accepted by the people of the city for the election of aldermen in Worcester. Nine aldermen are to be chosen and each voter may vote for six only. If two parties should nominate candidates, it may be presumed that the larger party will elect six and the smaller party three. Parties still smaller in numbers will have no hope of electing their candidates. As a voter, so long as he votes for no more than six persons, is not confined to the candidates of one party, it may happen that the popular candidate of a minority party may have more votes than one of the candidates of the majority, and thus the parties may be represented in the board by five and four members respectively, instead of six and three.

This system avoids the evil of excluding the minority altogether from representation, and that of restricting the choice of candidates within the narrow limits of single member districts. It is probably more suitable for the election of a board of aldermen than for any other political purpose. It gives minority representation; it does not give or attempt to give proportional representation.

You will, I hope, excuse me for adding here that this method of electing aldermen was not asked or suggested by any petitions from the city of Worcester. A petition asking for the adoption of a scheme of proportional representation in the city government, which will be explained later, was presented to the legislature with a bill carefully drawn in accordance with the petition. The legislature rejected that scheme, substituting for it this method of election by a limited vote, to take effect if accepted by a majority of the voters. It was so accepted, but the legislature of the next year enacted that it should not go into effect unless again accepted by the voters of the city. It was again accepted and is now a part of the city charter. It will have its first practical trial at the city election of this year. I believe it to be an improvement upon the former method of electing aldermen; that it is a measure of reform and progress, and, that therefore, its acceptance by the city under the conditions existing was wise, though if the alternative were a genuine system of proportional representation, the latter should, of course, be preferred.

2d. *The cumulative vote.* Each district being entitled to elect three representatives or more, each voter may cast votes equal in number to that of the representatives to be elected in his district, and may distribute their votes among the candidates as he pleases, giving one to each or all to one, or one-half the number to each of two or otherwise, and the candidates, to the number prescribed, having the highest number of votes are elected.

The present constitution of Illinois, adopted twenty-five years ago, provides for the election of members of the house of representatives of that State by this system, each district electing three representatives, and each voter having three votes, which he may give one to each candidate, all to one, or one and one-half to each of two. This trial of more than twenty years has demonstrated that this system gives representation to the minority in each district, and that it is simple and easy of operation.

It is generally, though not universally, conceded to be an improvement on the former method of electing representatives, which was that still used in most other States.

It gives representation to the two larger parties, leaving smaller parties unrepresented, but it does not, of course, give proportional representation. If the number of representatives elected from each district were larger, five, seven or nine for example, a chance would be given for the representation of smaller parties. But in that case many votes would probably be wasted by "plumping," that is to say, a voter's giving all his votes to one candidate, to the disturbance of the just distribution of representatives among the parties, for whatever votes the more popular candidate receives beyond those necessary to elect him, are lost to the other candidates of his party.

While each district elects only three representatives, it sometimes occurs that the smaller party elects two representatives while the larger elects only one. For, suppose that one party, having two thousand votes and nominating two candidates, gives twelve hundred votes to one and eight hundred to the other; another party, having eighteen hundred votes and two candidates, gives nine hundred to each. The latter, though smaller in numbers, will elect two representatives, and the larger party only one.

This has sometimes happened, but, it is said, not often. The possibility, however, compels the parties to use great care in making their nominations, so as not to couple together two men whose popularity is unequal. It has come to be the practice that, where the two larger parties are not very far from equal in strength, each nominates two candidates, and neither can afford to nominate any man of exceptional popularity, lest he should draw too many votes to himself to the injury of his associate. Each party being sure of one representative at least, it is said that there is the temptation, not always successfully resisted, to make the election a personal contest between the candidates of the same party, instead of a struggle between the two parties. Where one of the larger parties is a hopeless minority, it usually nominates but one candidate; and in such districts, the nominees, both of the larger and smaller party are sure of election.

A writer quoted by Mr. Matthias N. Forney in his book on "Political Reform by the Representation of Minorities" thus amusingly describes some of the workings and tendencies of this system: "When a district is very near equal in political strength, but two men are usually nominated on each side. A very popular candidate is liable to gather votes from his running mate and thus put them so far apart that their two adversaries will run in between them, especially if they are well matched and run well together or in a bunch, and it happens in every campaign in this State that a majority candidate is slaughtered, and although it seldom affects the result politically, for the reason that such accidents come to both sides, yet it leads to bad blood and open accusations of bad faith.

"The system puts a nominating convention on its good behavior when it comes to nominating candidates. They must see to it that their candidates are well yoked and well matched for running, for to win they must keep neck and neck. If the city population preponderates in a district it is poor policy to put a city and country candidate in the same team. A stampede would put the former in the lead. In a manufacturing district a labor man with a farmer or

a lawyer or a merchant makes a poor team to manage. A churchman and a sport won't work. A kid and an old man is no better. A native and a naturalized person is sure defeat for one or the other in a close district. In making nominations the convention must find pairs with respect to all the usual and ordinary elements entering into a hot political campaign. A candidate who runs too far ahead is just as dangerous to his party as the man who runs far behind, which is not the case in the old system. Under the latter the man who runs ahead does so at the expense of his adversary, but under the cumulative system it is at the expense of his colleague. His best friends and adversaries politically plump their votes, which takes one-half from his colleague, and that too when it is not necessary to elect him. The fear that he might get left induces his friends to plump just to keep him abreast of his colleague.

A great deal of plumping is done in every election, but if it is caused by natural causes, such as profession, nationality, color or social standing, the candidates come out even if they are both on an equality and evenly matched. If both are from the country or from the city each will receive about the same number of plumpers in his locality. If both are mechanics the labor unions will divide fairly between them. If both are Germans, Irish or natives their several clans will deal fair with them.

"Whatever advantage or disadvantage there is in the system it will accrue to both parties alike, and I can't see why, if one party should be for it, the other should be against it.

"The weak point in the system is that it breeds suspicion, jealousy and bad blood between the candidates, and sometimes leads to an open rupture among political friends. With two candidates on a side and only three seats to fill, one candidate will be left. Undue zeal or popularity on the part of one may defeat his colleague."

To-morrow I hope to consider the "Free List system," the "Hare system" or preferential vote, the "Burnitz system," and the "Gove system," their merits and defects, and explain why I prefer the last named.

RISE AND DECLINE OF NATURAL GAS FUEL.

B. H. BUTLER, IN *Pittsburg Times*.

Along the line of the Bradford, Bordell and Kinzua railroad, a crooked narrow gauge connection of the Pittsburg and Western in McKean county, are ranked up a number of piles of four-foot cord-wood. Through many years the wood has lain there in the piles decaying. These wood-piles are a monument to folly; and time, always charitable and kindly, is wiping them away as rapidly as possible.

The wood was cut to burn under the boilers that drilled oil-wells. It was left to decay because oilmen after years of wasting gas finally had sense enough to realize that it would make heat for a boiler as well as to burn at the top of a pipe outside the derrick. But all the follies that have been committed in the history of the discovery of gas, its uses, the waste of it, and in the refusal to accept it, would fill a volume.

The history of gas is the history of oil for nearly 20 years, except that the oil was used and the gas was despised. Nearly every well that ever produced oil produced some gas, and the great bulk of wells that turned out dry still supplied gas in greater or less

quantities. In early dates of Oil Creek, a great many gas-wells were discovered of decided volume, but they were abandoned, and looked upon as the extreme of abominations.

In 1872 the Newton well on Oil Creek was connected by four or five miles of pipe with Titusville, which is thought to have been the first effort to transport gas and use it for fuel. Gradually the vapor came to be used for fire about the wells, and slowly it found its way into the houses of the men who worked around the derrick. The Bradford field was so rich in gas, that the wells flowed without pumps for a long time, the gas pressure from below bringing the gas to the surface. Bradford, disgusted with too much gas, turned it in the air, and is now, after finding out what gas is worth, piping it from Kane, a distance of many miles. The big wells that have made Johnsonburg a town, wasted in the air several years before anybody thought it worth while to take any advantage of them.

Wasted Five Years.

But Pittsburg has nothing to boast of in the haste with which gas was adopted here. The Haymaker well at Murraysville was drilled in 1878. For five years the gas it produced was allowed to waste. The gas from the Haymaker well which wasted has been estimated at an equivalent of nearly 2,000,000 tons of coal. The Haymaker well is only one of an innumerable legion that did the same thing. Fancy can only picture the amount of fuel that has been turned into the air because people did not know that it had a value.

After the Newton well at Titusville set the pattern other wells were connected with pipes, and a few venturesome men burned gas in one way or another. How to handle it and use it were problems that took a good deal of thinking, but they were slowly solved. Eventually one of the Leechburg mills put some gas into the fires and used it along with the coal. In the fall of 1875 pipes were laid from Clinton Township, Butler County, to the Etna mills.

It was speedily known to the other manufacturers of Pittsburg that the venture had started at Etna, and millmen flocked to the works to see the novel fuel. Pretty near one voice arose as to the radical step. The firm was condemned as fitter for an asylum than the management of a big iron plant. There is an old story that nothing succeeds like success. The man whom the world regarded as crazy has but to make his insanity work out a successful theory, when the world is at his feet to say how wise he is. Eight years this firm fired its big works with gas, experimenting, improving and saving money by the use of the new fuel. It is all simple enough now to see how right they were, but then they had to demonstrate to every newcomer the possibility of their sanity and each newcomer went away doubting.

Pittsburg has lots of clear-headed ironmen, but it took them eight years to catch on to the possibility of gain in the use of gas. That is one of the most remarkable things in the whole remarkable and romantic history of the gas. While the millmen were slow to realize the importance of the work this firm had begun, the coal digger seemed to catch the meaning of it at the start. When the pipes were down the flow of gas through them was very disappointing. While the company was considering what to do with the venture, an intimation reached them that the pipes had been plugged by coal diggers one day while the laying crew was at dinner. To test the truth of the story a rubber ball the diameter of the pipe was made and inserted in the end at the well. The full head of

gas was turned on and the ball started down the line. After going some distance it stopped. Its action could be told by the noise it made while bumping through the tube. Where it stopped the pipe was cut out and three or four plugs were found stopping the passage of the gas.

For a year or so the expenses and changes in the furnaces in fitting them for the use of gas ran into money. Some things were done the wrong way. Often an expensive experiment proved a failure and had to give way to something else. But the company felt sure of its fuel, and they are burning it to-day.

Gas was put into the Etna works in the fall of 1875. Eight years later Pittsburg surrendered to the theory that had been ridiculed, and accepted gas. In 1883 the Penn Fuel Company, limited, brought a line from Murraysville into Pittsburg and a few families were supplied that winter with gas at 50 cents a thousand feet.

With the development of 1885 Pittsburg entered on a period of the most romantic and wonderful description. The like of it has never been heard of, and probably the world will never again look upon such an advent of Aladdin and the key to the treasure-house of wealth. From 1885 to the present day the pace has been one that nobody realized, and to-day the boundless blessings that came to Pittsburg and tributary country from the prodigal use and waste of this magnificent fuel are not grasped fully by a single man. The benefits are by no means ended, and will not be as long as Pittsburg shall stand; for the city received, and is receiving yet, an impetus that even those who have shared from the start to the present do not comprehend. It is the theme for the creation of the master of all fairy tales; and it is true. In the course of a decade a community of something like 200,000 souls developed and increased until in the same neighborhood are three times that many, and the most fabulous industrial hive that can be conceived of.

The Growth in Figures.

In 1885 Allegheny county was assessed on real estate \$199,664,065. During the eight years to 1893 this had increased to \$388,206,647. The aggregate value of all property taxed in the county increased during the same period from \$237,343,413 to \$435,886,987. In Pittsburg alone the increase of the cash values was from \$123,308,631 in 1885 to \$275,650,166 in 1893. While the whole county made great advancement owing to the development of gas, Pittsburg made greater proportionate gain than the rest of the county. Pittsburg lacked only two per cent. of doubling her assessed value in the eight years. In 1884 17 blast furnaces in Pittsburg made 487,000 tons of pig. In 1890 the number of furnaces had increased to 25 and the output of pig to 1,489,000 tons, three times as much.

While gas was still a new thing, millmen figured that it saved them in the cost of fuel about 12 per cent., besides making better iron. Not all of them to-day are willing to admit that the benefits were as great as then seemed apparent. Certainly those who introduced gas into their mills and factories late in its history lost money; for what with the cost of changing the furnaces to accommodate gas and then changing back to coal soon after, all the benefit was consumed in the expense of the changes. It was in the stimulus that gas gave the city that the greatest blessing was felt. In the advertising it gave Pittsburg to the outside world gas did as much as all other things together. It raised the standard of quality of Pittsburg product, in that respect confer-

ring a permanent benefit on the whole world; for other manufacturers were forced to work up to that standard ever since. In the household the benefit was beyond realization. The laborious and dirty coal fire was displaced by a cheap fuel, on tap at all times, available for as long or as short time as might be desired. The condition of the home changed completely. An æsthetic era was ushered in. Neatness and adornment became the rule because it was possible. Where soot and smoke had forced the reign of sombre colors in household furnishing, the clean fuel permitted everything. Ornamental stoves and grates were a study of the manufacturer. The factories vied with each other in turning out handsome and useful appliances for the burning of gas. The spirit of beautifying the home grew.

Advent of Gas in Pittsburg.

Some peculiar history accompanied the early experience of the gasmen. The first company started was the Fuel Gas Company. The Penn Fuel Company was the first to get its lines into Pittsburg. The Fuel Gas Company was organized by Dr. Hostetter, R. B. Brown, H. Sellers McKee, George Trautman, W. H. Aldred and Stewart McKee. The charter was taken out under the act of 1874. The Fuel Company were preparing to go about the production and sale of gas in a deliberate way, and to that end arranged for the drilling of wells and the construction of pipe-lines. While the Fuel Gas Company were making their plans, and letting the world know what they had in progress, the Penn Fuel Company concluded to play a different sort of a card. Pew & Emerson, who were the Penn Fuel Company, decided to lay their lines and get the charter; but the lines were the important thing, and work was commenced in the field while the Fuel Company were delaying for the perfecting of the company. The Fuel Gas Company got their charter first; but the Penn Company, by dint of hustling, got their lines started first.

Then a picnic followed. R. B. Brown was general of the armies laying pipe for the Fuel Company. Pitted against him was J. N. Pew, of the Penn Company. The two rivals worried each other in every way; but the Penn Company, by earlier occupation of the field and securing the right of way, did the bulk of the worrying. The Penn Company had leased the right in the direction the lines must run, and then frequently they leased exclusive right laterally from their lines north and south, so that the Fuel Company could not cross to get to Pittsburg.

The Fuel Company played a card then that nearly knocked the gas business into a cocked hat. They were the first company chartered under the act of 1874, and under it they claimed exclusive right to pipe and supply the City of Pittsburg. It is true that only one light company could manufacture gas under that law, and the attorney-general of the State granted a quo warranto, restraining the Penn Company from doing any more trouble. Then the courts got a whack at the dispute and decided that the Fuel Company had the exclusive right under the law to pipe and supply Pittsburg. The case was promptly carried to the Supreme Court, which reversed the decision, on the grounds that the law was not applicable to natural gas companies at all. This decision left both the companies without a charter until the Legislature, in 1885, passed the natural gas act.

The Chartiers Company, the Pennsylvania Company and the Philadelphia Company practically entered the field the same year, the Philadelphia Company finally swallowing the Pennsylvania and the Chartiers.

Birth of the Philadelphia Company.

The Philadelphia Company bought a charter which is the twin brother to that of the Pennsylvania Company, under which the Pennsylvania lines west of Pittsburg are operated. It was not a gas company charter, but was one of those general affairs that were more common a few years ago than at present. The Fuel Gas Company also bought one of the same kind but let it go again.

The Philadelphia Company, the foremost of all the natural gas companies, was organized in 1884. It had its birth in the phenomenal but short-lived well on the Westinghouse grounds at Homewood. The capital stock at the start was \$100,000, which was later increased to \$5,000,000. A popular subscription to half the stock was instituted and prospective consumers took stock rapidly. This plan was pursued to interest as many people as possible, make the company a popular venture and head off any cry of monopoly. In September of 1884, \$1,000,000 of the capital stock of the company was issued, and active operations were commenced in October following. Work started on a gas line from Tarentum to Hoboken, and from Murraysville to Hoboken, a point a few miles up the Allegheny from Pittsburg. From there lines were laid down the river on both sides to Pittsburg and Allegheny mills.

By the first of 1885 fourteen wells were completed at Murraysville, and the natural gas business was inaugurated in earnest. One of these wells was the Philadelphia Company's No. 1, a large producer, which was blowing into the air. During the winter the construction of pipe-lines and the drilling of wells at Murraysville was marked by remarkable activity. Two years later the number of wells in the Murraysville field had reached 75, while other fields in the neighborhood of Pittsburg began to yield up their treasure.

1886 was a year of rapid development. The capital stock of all the gas companies operating in the field at that time has been estimated by good authorities at \$15,000,000. The income of the Philadelphia Company for the year is given at from \$1,500,000 to \$2,000,000, which enabled dividends of 12 per cent. to be declared. The beginning of 1887 saw six companies in the field piping gas to Pittsburg from more than a hundred wells at Murraysville, Hickory, Canonsburg and Tarentum. Murraysville, the chief source of supply, furnished two-thirds of the fuel.

Effects of the New Fuel.

The arrival of the new fuel made a wonderful change in Pittsburg. Early in 1885 the changes commenced, and the spring of that year was young yet when the mills and factories surrendered to the new force. Ten thousand men are said to have been added to the working mill-force in 1885 by the developments following the introduction of gas. The rapid heating of the gas increased the effectiveness of the plants, forcing the machinery to run faster, thus increasing the daily output. Gas was also coming freely into use in the houses for domestic purposes. In 1885 the amount of coal displaced by the use of gas in Pittsburg amounted to about 2,500,000 tons. This amount was doubled the next year. In 1888 it had doubled again, reaching 10,000,000 tons, with a value of \$14,000,000. In spite of the large quantity displaced by gas, the coal production of Allegheny county held its own, amounting to 4,202,000 tons in 1886 and 4,894,000 tons in 1890, a steady increase from year to year. The river and rail shipments, together with the wonderful growth of Pittsburg industries, proved sufficient for all of the new fuel with-

out permitting the old one to suffer. While gas was taking the place of so much coal it might have taken the place of a good deal more if all produced had been consumed. But the quantity wasted is said to have been more than half the amount used at that time. Gas was a novelty and nobody was familiar with it. No incentive was offered to economize. The fuel was sold at so much a month or year, or based on the previous cost of coal.

The consumer was free to burn all he cared to. With no restrictions he felt no concern in how much he burned. It was no uncommon thing for mills to melt down their smoke-stacks instead of melting the iron in the furnace, so intense was the heat allowed to escape up the stack. In the first five years of its practical use enough gas was wasted to run the mills of Pittsburg 10 years under a system of rigid economy.

The Pipes too Small.

One of the most astonishing misconceptions of the growth of the gas industry is seen in the facilities for transporting the first gas brought to the markets, and the facilities required a year or two later. When Emerson & Pew laid the first line from Murraysville to Pittsburg, a six-inch wrought-iron pipe was put down. That was supposed to be sufficient to satisfy the demands of the business. January 1, 1886, saw 325 miles of pipe laid in Pittsburg for the distribution of gas, of which 40 miles was from 10 to 30 inches in diameter. By the middle of the year one 24-inch line, two 10-inch, six 8-inch, two 16-inch and three 5½-inch lines came in from Murraysville, with lines under construction from Washington county, and lines already in operation from elsewhere.

The 1st of January estimated the pipes in the city at 235 miles, ranging in size from 3 to 30 inches and valued by the assessor for tax purposes at nearly \$2,000,000. Figures given out then put the expenditure during the year by the various gas companies at \$5,000,000 in the development of the plants, which expense included the wages paid an army of some 8,000 men. Two years later the Philadelphia company supplied gas to 150,000 fires for domestic uses, to 30 iron and steel mills, 32 glass-houses and to 638 other industrial establishments.

The End Is Seen to Approach.

Estimates made by the statisticians in the employ of the Federal Government place the consumption of gas in Pennsylvania as follows: The value of the gas consumed in 1885 was \$4,500,000; in 1886, \$9,000,000; in 1887, \$13,749,000; in 1888, \$19,300,000; in 1889, back to \$11,593,000; in 1890, \$9,551,000; in 1891, \$7,832,000; in 1892, \$7,376,000; in 1893, \$4,500,000. This is the value of the whole consumption of the State, but it is quite indicative of the rise and decline of the business in Pittsburg.

While 1887 was a remarkable year, the highest point was hardly seen until 1888. Then a turn in the tide came. New fields had been found necessary. Grapeville was drilled in and piped while the industry was comparatively new. Washington, Beaver and Allegheny were chopped in holes in the search for gas. But, in spite of the effort to widen the field, it began to be apparent that the end would soon come. Economy was now talked of in the use of the fuel which had been in its earlier day looked upon as so cheap and inexhaustible that it was easier to let it burn than to turn out the lamps during the day or the fires at night, even though they were not needed.

Meters gradually came into use. Later on the supply grew somewhat uncertain. One by one the mills returned to coal for fuel, until at the present time

coal is the staple, as it was fifteen years ago. Looking backward, it seems singular that such unpardonable waste of gas was permitted, but from the beginning to the end of human experience with this fuel man has gone at its use like the negroes did picket duty in war time. The colored man shot first, then called "halt." Geologists and scientists foretold its exhaustion, but as a rule were ridiculed for theorists.

The Folly of the Wise Man.

The men who wasted gas prided themselves on being what the world calls "practical" men. So, instead of taking steps to save gas when it seemed at all short, more wells were sunk, which meant more gas turned into the air or into the pipes to run through the furnaces and stoves in wasteful manner. The trouble was that everybody but the geologists imagined the gas would hold out forever and that new fields would open everywhere. The fundamental error in the use of gas was in the style of selling it by the month or year. It would be as wise to sell flour or coal that way. Yet the early prospectus of the gas companies told the consumers that they were free to burn all they wanted. In other words, economy was unnecessary.

The development of manufacturing in Pittsburg was imitated elsewhere. When gas was found in Ohio and Indiana, the whole country from Pittsburg westward became a great manufacturing centre. The output of manufactured articles in the United States was materially raised because of it. As the gas fails other places the manufacturing must ultimately be done at Pittsburg, where fuel is abundant in the coal fields. The manufacturing will still be done. The American people have learned to need lots of things not made in this country until gas was utilized, and others that were made indifferently. The people are not going to get along without those things, now that they can be produced. In other words, a market has been created, and it will be supplied.

"The best days of the whole business," said R. B. Brown, of the Equitable Company, "I think, were early in its history. Then we had lots of it, and it seemed that all we had to do was to get the pipes down and deliver the stuff without wondering where the supply of the future was to come from. In 1885 it began to be apparent that the end was approaching, although the people, as a rule, did not realize it or believe it. We, who were in the business, did, because it was forced upon us. As the pressure at the wells grew less each day and we had to hunt for new wells and new territory, it was easy to forecast the end. There was but one Murraysville, and it is not probable that there can be another. The country has all been drilled over to such extent that its capabilities are pretty thoroughly known. What the future of the gas business is I cannot say. It is a romance to look back over the past. This I know, that if we could start anew, with the gas as it was and our present knowledge, we could make fortunes for the gasmen, for the consumers of fuel, and for pretty nearly everybody who wanted to profit; for fabulous fortunes have been wasted in the astonishing waste of gas, and in the methods of learning its uses. Fortunes could have been saved in the one item of piping alone if we had known how to proceed at the start. Gas will flow with less friction through a big pipe than through a small one. If we had laid 36-inch pipes at the start instead of 6-inch pipes, we would have had gas in Pittsburg from small wells that had hardly pressure enough to force it through small pipes, and so wasted it at the well."

A Good Business if Attended To.

"I do not think," said a business man, "that gas and oil is a bad business. A good many men have made and lost money in the business, and I believe that those who stick to it, following it intelligently as they do any other line of industry, are all right. Pittsburg has a great many wealthy men whose money came from the drill. Of course those who go into the business as a side issue, giving it but little attention, are liable to lose their money, just as they would if they put it into any other thing without sufficient attention. No doubt the men who have made the most money out of gas are the people who owned the lands. They had held their property for its meagre return as farm lands. When the gasman came to them with bonuses, royalties, lease money and right of way fees, the farmers gathered up such sums of cash as made them comfortably well off. They, as a class, have profited the most. Next to them, I would say, are the men who laid gas lines to supply the country towns. Such plants were cheap, and were operated at slight cost. Nearly all the income was profit. In the city, plants were expensive, and the salaries of a force of officers and employees took a great deal of the income."

No fabulous fortunes were made in gas as in oil, and no men left high on the beach as with the greasier fluid. The whole community derived more or less benefit, and will feel the effects of it for a generation to come. Some years ago S. Daum was the name of a Pittsburg business man. Affairs went crosswise with him, and he moved his family to a farm of 300 acres that he had saved out in the country. Daum had slight knowledge of the farm, and his success was but a sorry promise. One day a gas-well was drilled on his land. It found gas. A rivalry sprung up between the various companies for the privilege of drilling more holes. Daum found himself with more money than he had ever dreamed of owning. The ground that he could not farm a living out of produced a fortune in an easier way. His farm was among the best in the Murraysville field.

A small, isolated gas-well in a country where others own the leases of the surrounding farms has less value than an oil-well. Oil can be run into a tank at any place it is found almost. Gas is not valuable unless the owner can sell it to one of the large companies, who, however, are generally ready to pay a moderate figure for a well that promises good.

MASS MEETING IN THE CHAPEL.

Three hundred dollars pledged.

The meeting was called to order October 12, at 11.45 A. M., by Dr. Mendenhall. He congratulated the members of the Institute on the successful beginning of the new school year. Below is an abstract of his remarks.

He called attention to the fact that a few of the students had not yet paid their tuition. In a few years, in all probability, the payment of tuition will be a part of matriculation. The attendance, on the part of some of the students, is not as good as it should be, and already some have taken all of the 10% allowed. If an excuse for absence is good, it is well to inform the instructor about it, as it keeps the student's personal standing better, and if his school

standing is good, the examinations are sometimes waived. The members of the football team should report their excuse to the professor, as he may not understand it and mark an absence. Notice was called to the breaking of lockers in the basement.

Dr. Mendenhall then spoke of the W P I, saying that it was full of interesting Tech news, and was one of the things that kept the Institute united. All should subscribe for the paper and contribute to its columns. Great interest should be taken in athletics and everyone should do all he can to help them. Some day in the near future there will be a gymnasium at the Institute, and the greater the interest taken in athletics now, the sooner the gymnasium will come. Athletics here are of three kinds, — track athletics, football and baseball. They should be united under one head, and all of the money needed for their support should be raised at the beginning of the year, and not by subscription, from time to time. They would then come under one head. The expenses for the year will be about as follows: football \$175.00, track athletics \$75.00, baseball \$200.00, making a total of \$450.00. The classes have already contributed, and about \$150.00 has been raised. This leaves \$300.00 to be raised. The Doctor said that some could not give anything, others could give a little, and still others could afford to give a large amount. Dr. Mendenhall then called to the chair, Pres. Parks of the Athletic Association.

Mr. Parks said, that it remained with the students whether the money should be raised or not, and that everyone should do his share. Prof. Coombs was then asked to say a few words.

Prof. Coombs spoke in a very inspiring manner, calling attention to the victories of the past. The football team had not been beaten this year and is in good condition. Only a few make good athletes and work for the glory of Tech, but all can help by taking an interest and giving money for the support of athletics. Mr. Parks then called for subscriptions. Mr. Harris moved that the amount pledged should be placed on the blackboard, under the class of the subscriber. Prof. Coombs acted as teller. The summary of the subscriptions for the classes is as follows:

'96,	-	-	-	-	\$91.00
'97,	-	-	-	-	53.00
'98,	-	-	-	-	91.00
'99,	-	-	-	-	57.00
					<hr/>
					\$292.00

The meeting adjourned at 12.30. The above sum was pledged within twenty minutes.

Mr. Riley, Treasurer of the Athletic Associ-

ation, is, for very obvious reasons, anxious that the above subscriptions be paid as soon as possible. To facilitate the collection he has appointed the following men to receive the money pledged by the respective classes: C. F. Vaughn, '96, R. E. Fish, '97, F. A. Harrington, '98, and C. T. Rebboli, '99.

W. P. I. vs. N. A. A.

Tech's football eleven met the first defeat of the season Saturday at Newton, where they played the Newton Athletic team. Tech had no hopes of winning from such a team and were well satisfied with the showing they made, the score being 12-0. The Newton team was made up of very heavy men, most of them Harvard men, and beside such a "beefy" team the Institute eleven looked like pygmies. Tech, however, played a plucky game and won the esteem of the Newton team. The Tech men did not reach the grounds until late, and it was past 4 o'clock when the game began.

Capt. Harris won the toss and chose the windward goal, leaving the ball to Newton. Morse secured the ball on the kick-off, and brought it back to Worcester's 35-yard line. Several plays through the line and two end-plays placed the ball on Newton's 25-yard line. At that point the home team made a decided stand and secured the ball on downs. Then the weight of the Newton men began to assert itself, for the visitors could not withstand their onslaught. Slowly the pigskin was worked back to Worcester's 50-yard line. Wales then took the ball around Tech's left end and shaking off all tacklers scored a touchdown. Teal kicked goal.

Newton brought the ball back 15 yards on Worcester's kick-off, and then made steady gains until the ball was on Tech's 40-yard line. Sears took the ball around the visitor's right end, and, aided by fine interference, scored the second and last touchdown. Teal kicked another goal.

After this the Worcester team braced up wonderfully, and not once during the remainder of the game was their goal in any danger. Rebboli injured his ankle about the middle of the half, and retired in favor of Harris. When time was called the ball was in Newton's possession, near the centre of the field.

The second half was shortened to 10 minutes on account of approaching darkness, and only five minutes was allowed between the halves.

Both teams played a hard game during this half, but neither side could score, the ball changing hands several times near the centre of the field.

At one time it looked as though Tech would score. Newton had the ball on its own 35-yard

line, and on the third down, with seven yards to gain, passed the ball back for a punt. Worcester got through and blocked the punt, but Newton secured it, and, having lost 20 yards, it remained in Newton's position, being first down on its 15-yard line. Tech secured the ball soon after this, but could not gain the line before time was up. The game ended with the ball in Tech's possession in Newton's territory.

The best playing for Worcester was done by Booth, who played half-back without a day's practice. His defensive work was the best on the field. Rebboli played a strong game at quarter until obliged to retire.

Newton's three backs did the greater part of the work for that team.

Following is the line-up and summary:

N. A. A.	W. P. I.
Mason, l. e.	l. e., Goodrich.
Nash, l. t.	l. t., Macomber.
Warren, l. g.	l. g., Ross.
Kimble, c.	c., Riley.
Eddy, r. g.	r. g., Harrington.
Teal (capt.), r. t.	r. t., Durand.
Johnson, r. e.	r. e., Brown.
Smith, q. b.	q. b., Rebboli (Harris).
Nichols, l. h.	l. h., Booth.
Sears, r. h.,	r. h., Vaughn.
Wales, f. b.	f. b., Morse.

Score: N. A. A., 12; W. P. I., 0. Touchdowns, Wales, Sears. Goals kicked, Teal 2. Time, 20 and 10 minute halves. Referee, Gage. Umpire, Hoag. Attendance, 400.

SECOND ELEVEN vs. LEOMINSTERS.

The Tech second eleven played its second game of the season, Saturday, the 19th, with the Leominster Athletic Club on the latter's grounds. The Tech team was much lighter than their opponents and did well to keep the score from being larger.

The game was called at 3.30, with a high wind blowing directly down the field. Leominster won the toss and Tech kicked off. After an exchange of punts Ferry got the ball near the centre of the field. After about five minutes' play Leominster scored her first touchdown on a fluke. The ball was in Tech's possession on her 30-yard line and was snapped back before the signal was given. It rolled towards the end of the line and was seized by a Leominster back and rushed down the field for a touchdown, from which a goal was kicked. Score: Leominster 6, Tech 0.

Tech then kicked off and the ball was Leominster's on their 30-yard line. After the ball had gone back and forth for some time Tech succeeded in pushing Leominster back to their 5-yard line, but Leominster held for four downs, and Tech's only chance for scoring was gone. Leominster then rapidly worked the ball back

and finally scored from Tech's 20-yard line by a run around their right end. No goal. Score: Leominster 10, Tech 0.

Time was called immediately after the try for goal.

In the second half Tech's play improved and it was only after ten minutes' hard play that Leominster succeeded in scoring from Tech's 10-yard line. An easy goal was kicked. Score: Leominster 16, Tech 0.

This ended the scoring, and for the rest of the game neither goal was in danger. Before and after the game the Tech players were entertained at the Columbia Hotel by the Leominster boys, and report a very good time.

The line-up of the teams was as follows:

LEOMINSTERS.	2D POLYTECHNIC.
Sullivan, l. e.	r. e., Edwards.
Mulquery, l. t.	r. t., Smith.
Nutting, l. g.	r. g., Leonard.
Foster, c.	c., Davis.
Alton, r. g.	l. g., Craig.
Dyer (Earle), r. t.	l. t., Alderman.
Scott, r. e.	l. e., Storer.
Corthorne, q. b.	q. b., Synyer.
Earle (Dyer), r. h.	r. h., Dimick.
Richardson, l. h.	l. h., Fish (Throop).
Davis, f. b.	f. b. Ferry.

Score: Leominster, 14; 2d Polytechnic, 0. Touchdowns, Richardson 3. Goals from touchdowns, Richardson 2. Time, two 20-minute halves. Attendance, 150.

FIRST CROSS-COUNTRY RUN.

Boathouse to Barber's Crossing and Return.

The first of the series of three cross-country runs was held Friday, Oct. 18, the course being from the boathouse at Institute Park to Barber's Crossing and return.

There was a smaller number of starters than usual, only 23 men toeing the mark. This was so owing to the fact that the class of '96 did not enter a man, a rather peculiar coincidence. The winning of Baker, '99, was a surprise for the "talent," who rather expected the older and more experienced Lundgren to carry off first honors. The latter runner, from some unaccountable reason, had to be contented with fourth place. The fight for first came between Braman and Baker, but the latter finally won by about 15 or 20 yards, in the slow time of 28 m. 10 sec. The winner, by the way, is a brother of Baker, '93, who used to carry Tech colors to the front in long distance runs.

The officials of the run were as follows: referee and starter, Prof. Coombs; judges, Jencks, '96, Whitney, '97, Clark, '98, Smith, '99; judge at turn, Reed, '98; clerk of course, O'Connor, '95; timers, Bloss and Alden, '98.

The following men were entered:

'97—Braman, Wheeler, Lundgren, Walsh, Wilmarth, Ellinwood, Merchant, Earle.

'98—Whittemore, H. C. Smith, L. Smith, Dimick, Hayes, Hastings.

'99—Baker, Davis, Smith, Shute, Traill, Gould, Scott.

There was no fighting for the lead at the start, and the bunch kept well intact as far as Chadwick Sq. Then Baker and Braman began to pull away from the rest. Baker turned the stake in the lead, with Braman several yards behind him. The bunch was about 60 yards behind Braman. After the turn Braman ran a very pretty race, slowly cutting down Baker's lead, until near Chadwick Sq. he came abreast of him. From here in it was nip and tuck between them. Baker led coming into the Park. Here Braman lost by keeping to the road instead of going over the hill by the tower. Baker crossed the line with a comfortable lead. Braman finished second and Whittemore, a new man at running, a good third. Lundgren followed him closely. The rest came in at short intervals.

The points were won as follows: Baker 20, Braman 19, Whittemore 18, Lundgren 17, Scott 16, Dimick 15, Shute 14, Merchant 13, Wheeler 12, Gould 11, M. A. Smith 10, L. Smith 9, Hayes 8, Walsh 7, R. Smith 6, Traill 5, Davis 4, Earle 3, Hastings 2, Wilmarth 1.

The Freshmen secured the most points for the banner, a total of 80. Ninety-seven was second with 72. Ninety-eight third with 52.

The next run will be to Tatnuck and return. It will probably cause much interest as the contest between '99 and '97 is extremely close.

N. E. A. A. U. CHAMPIONSHIP GAMES.

Tech Shows up Well.

The championship games held at the Oval, Oct. 12, were interesting to all Tech men, for aside from the team race with Holy Cross several Tech men were entered in the events. The showing made by the Tech athletes was a surprise to all the members of the Institute, for none of them had done any training for the events. Lundgren in the high hurdles, Morse in the low hurdles, and Scott in the pole vault were the only Tech men who answered the call for the events. The dismal rainy day made it impossible for any of the men to do their best. This was especially true in the field events, and after one or two attempts at vaulting in the mud and water Scott gave it up.

Lundgren and Morse both did good work, each winning second place in their events. The high hurdles were won by Hoyt in 16½ seconds,

and the low hurdles by Bremer of Harvard in $27\frac{3}{4}$ seconds.

The team race between W. P. I. and Holy Cross was the most exciting event of the afternoon, and came next to last on the card. Lundgren and Vaughn both gained on their men, and Harrington held his own, giving O'Connor a lead of 15 yards over Sockalexis, the pet runner of the Holy Cross men. Sockalexis started out at a terrific clip to cut down the lead, and the Holy Cross men were in great excitement, when he caught and passed O'Connor at the lower turn of the back stretch. Everyone, however, realized that if Sockalexis could hold the pace for a quarter he would be a phenomenon, and the Tech men felt confident that "Tim" would beat him out on the home stretch. Nor were they disappointed. O'Connor followed gamely up the back stretch, running easily. At the upper turn he drew up on the Holy Cross man, and when they straightened away for the home stretch everybody saw that he had the Indian beaten, for he passed him at the head of the stretch and finished with a burst of speed like a race-horse. Sockalexis had run himself out and could scarcely drag himself across the line. A great deal of enthusiasm was aroused and the teams will doubtless meet in the Rink this winter.

WASHBURN ENGINEERING SOCIETY.

Report of Annual Meeting.

The first meeting of the Washburn Engineering Society since the opening of the Institute year was held in the lecture-room of the Engineering Laboratory, Monday evening, Oct. 14th. About forty members were present, the Senior and Junior classes being well represented. A smaller number of Alumni than usual was present, and the room, which seats over two hundred, seemed very scantily filled. The Faculty were represented by Profs. Sinclair, Higgins, Alden and Bird.

President Clement called the meeting to order and the report of the previous meeting was read by Secretary Alden, and accepted. After the Treasurer's report the following were admitted to membership: C. W. Alderman, '96, Horace Carpenter, '96, W. S. Moorehouse, '86, and W. H. Morse, '95. The following were elected as honorary members: C. H. Morgan, C. P. Allen and W. H. Coughlin. Heretofore there have been no honorary members. Mr. Cole announced several changes in the constitution which he should propose at the next meeting of the society. These changes related to membership and provide that others than instructors

and students, such as journeymen employed at the Shop, may become associate members.

As the society neglected to choose a nominating committee at the last meeting, the Board of Managers chose the following, which action was ratified by the society: A. L. Smith, H. W. Jencks, Prof. Sinclair, C. M. Allen and E. H. Fish. The nominations made were: President, J. B. Mayo, '96; 1st Vice-Pres., V. E. Edwards; 2d Vice-Pres., H. W. Jencks; 3rd Vice-Pres., J. O. Phelon; 4th Vice-Pres., A. D. Butterfield; 5th Vice-Pres., C. M. Allen; Secretary, George I. Alden; Treasurer, W. F. Cole; Councillors, W. P. Dallett, '81, W. W. Estes, '84, A. P. Allen, '89, M. J. Lyden, '92, E. W. Davenport, '94. These officers were subsequently elected. In the absence of Mr. Mayo, Mr. Jencks took the chair. Upon motion of Mr. Bird it was voted that the Board of Managers should act as a committee to receive any communications from the Worcester County Society of Civil Engineers with regard to consolidating the two societies.

The speaker of the evening was R. H. Aldrich, '84, whose subject was "The Gas Engine as a Prime Motor." As he spoke without notes, the following is merely the substance of his remarks.

People are apt to think the gas engine is only adapted to small powers and that it must be confined to the cities. There is, however, a larger field than illuminating gas for our three fundamental heat energies. Coal, oil and natural gas may be converted to mechanical energy by the gas engines.

First, natural gas is converted with a single operation to mechanical energy. A large area of this country is rich in natural gas and from one thousand five hundred to three thousand wells have been drilled. These wells are eight-inch holes and furnish from one hundred to five thousand H. P., while some wells produce even more than that. The wells are very constant in flow, and, although much gas has been wasted, there are now many improved methods for its preservation. The ordinary well costs about two thousand dollars and gives from two hundred and fifty to five hundred H. P. for five years, although some new wells run out in one or two years.

There is a new field for gas engines in connection with the oil trade. In the natural gas wells, pressure causes the gas to flow; but in oil wells the oil must be pumped. With the oil, gas is always present, and at present over one thousand steam engines are used in pumping oil from one thousand to three thousand feet. These engines are from fifteen to thirty H. P. and burn natural gas under the boilers. If the

gas engine were used it would do away with much unnecessary machinery and obviate the difficulty of procuring water for the engine, while it would also save the labor of an operator. In the West there is a large field for gasoline and crude petroleum engines, for the pumping of water for farm buildings as well as for irrigating. Over one hundred thousand windmills are sold annually for that purpose, but the farmers are discarding the windmills, which are unreliable, and adopting the gas engines. The ordinary portable steam engine of fifteen H. P., with equipment, weighs about five thousand five hundred pounds, while an extra wagon for coal and one for water must be provided. A gasoline engine of the same size would weigh but three thousand three hundred pounds and would not require the two extra wagons. This machine is provided with a gasoline tank of fifty gallons, which is sufficient to run it a week. When the energy comes from the coal the total cost of producer and engine will not exceed the cost of a steam plant, while a H. P. can be generated on one-half the coal which a steam plant would require.

One of the serious drawbacks to the gas engine is the difficulty in starting. There are several ways of starting large engines, the two principal ways being by the use of compressed air and by exploding mixtures of air and gas at the proper time. A fault with former engines has been that low piston speed has been maintained, thus giving an immense cooling surface, the heat being conducted through the cylinder. Small engines now run at the low speed of two hundred and fifty revolutions, while a greater speed would increase the economy materially. There is also a waste due to the water-jacket. An automatic arrangement might be provided to adjust the water flow, which would also prove a great saving. By careful regulation by hand, as high as twenty-five per cent. has been saved. Still another fault is that gas engines have been constructed too light for the enormous pressure, which comes only at regular intervals. The making of larger sizes is also advantageous. The use of the gas engine was then considered with regard to electric lighting.

After the discourse of Mr. Aldrich, Paul B. Morgan, '90, enlarged upon many of the points touched upon by Mr. Aldrich, especially the producing plant. The gas engine was further discussed by Mr. C. H. Morgan, who had just been elected an honorary member.

The dates for the remaining meetings of the year will be,

Dec. 16th, 1895,	Mar. 23d, 1896,
Feb. 10th, 1896.	May 4th, 1896,
	June 17th, 1896.

RAMBLER.

The perennial football notices on the bulletin board summoning the valiant to their duty and the pusillanimous to give up their mite, is the centre of the storm which whirls incessantly through Boynton Hall. The bulletin board in its picturesque features is unique. The man who has been out the night before and needs some soothing influence finds a Y. M. C. A. notice to calm his ruffled spirit. The embryo politician finds the advertisements of sundry occasions where he may learn the beauties of stuffing the ballot box and the wickedness of voting the independent ticket. Everything from a room to a meal, from a summons to the office, to the way to the Front St. Musee is there. All these things are right in order, but a grand opportunity is being missed to lift the bulletin board "to the level of the skies." Rambler is fully aware that it is an æsthetic proposition he is about to make, but is willing to divulge it for his own delectation and the public weal. Why not make it an art centre instead of a storm centre? A clever little sketch on every notice, or the sketch without the notice—oh what a thing to delight the eye, tickle the fancy and create a demand for the beautiful! There would be no necessity for the "busy engineer to be" to trot down to the Public Library to lay the foundation of a true art sentiment by surveying photos of Egyptian mummies, but a genuine up to date exhibit would be constantly before his eyes—an exhibit that would do credit to Remington or Thurlstrup or Clark ex-'96. Character sketches of the gridiron are now in order, but the field extends far beyond the goal posts and is ever widening to the man with his eyes open. Come, artists, show that the endeavors of the free drawing master have not been in vain, but a source of pleasure and joy forever!

MEETING OF THE CLASS OF '99.

A meeting of the class of '99 was held Oct. 16th, and the following officers were chosen: Pres., C. Kinney; Sec., A. C. Vinal; Treas., A. A. Kent.

This meeting was adjourned at 12.30 as some of the students were obliged to return to the Shop at 1. Another meeting was held Oct. 18. Mr. F. W. Putnam was chosen vice-president. A committee on yell and colors was chosen which consisted of E. R. Johnson, chairman, Hussey, Scott, Putnam and Baker.

A DISTINGUISHED VISITOR.

On Wednesday, Oct. 9th, Tech was visited by Mr. Theodore G. Hoech, a member of the Imperial German Embassy, which is now in the

U. S. inspecting various mechanical works. Mr. Hoech is a member of the American Society of Civil Engineers, and bears the title of Royal Prussian Inspector of Public Works.

He was particularly interested in the hydraulic plant at Holden, which was shown him by C. M. Allen, '94. He was much pleased with the plant and took careful note of the various pieces of apparatus.

DR. MENDENHALL AT ATLANTA.

A Judge of Awards.

On Monday, Oct. 14th, Dr. Mendenhall started for Atlanta to act as one of the Judges of Awards at the Exposition. The judges at the Exposition are in charge of Dr. Gilman of Baltimore, and Dr. Mendenhall has been chosen chairman of one of the juries. A special train was provided for the judges from New York to Atlanta, going via Washington, where only a 20-minute stop was made.

The Washington Alumni wished to tender a reception to the Doctor while in Washington, but owing to the special arrangements for transportation he was obliged to decline. He will probably be away till about the first of November.

SHOP NOTES.

During the vacation the machinery in the wood room has been entirely rearranged, the greater part of it having been moved into the new shop, while the Freshman room has been moved bodily to the north, making a new room over the present office and drafting-room, which is to be used for a drawing room. This new drawing room will be connected with the office by a passenger elevator.

The Freshman room as rearranged is L shaped, the branch of the L running along the east wall of the old shop, making a sort of an alcove, by itself. For the lathes a heavy line of shafting in the wood room has been enlarged and carried to the south, opposite the line where the power is to be brought in from the new power house. No particular changes have been made in the arrangement of the stairs during the summer.

The Shops have installed elevators in Providence, Pawtucket, Fitchburg, Leominster, Lowell and Lawrence, and the men are now at work in Boston, Providence, Pawtucket and Pittsfield. At the latter place one of the elevators being installed is to be driven by an electric pumping plant. This is believed to be the first time an alternating current motor has been used for elevator service, with the alternate starting and stopping, and will require considerable special

controlling apparatus, which will be designed and built at the Shops.

A recent test made on one of the pumping plants lately installed by the Shops shows that the cost of running the elevator by this means to have been reduced over 60%.

The usual number of drawing stands and twist-drill grinders have been built this summer, and the Shops are quite busy on orders ahead for elevators and other articles.

TECHNICALITIES.

The entire Sophomore class is having a course in scientific German.

Walter A. Clark, ex-'96, is studying at the New York Art League.

Several '99 men from the Worcester High School are taking the chemistry course.

Students are requested not to use the elevator in the Salisbury Laboratory. Well, if time was any object this request would be unnecessary.

Students are also reminded that hat rooms are provided in all the buildings and are urged to use the same.

The foundation for the main shaft from the power house to the shop is being laid. The shaft will be about three feet below the floor and a quarter turn in the belt will be necessary.

1st Soph. "There, I have spoiled this bolt, I have cut eleven threads to the inch instead of ten."

2nd Soph. (after carefully counting the threads). "Well, we can fix that all right, just cut off one thread."

Several of the rooms in Boynton Hall are decorated in water colors after the recent storm.

ALUMNI NOTES.

'88. J. B. Chittenden is now instructor of higher mathematics at Columbia College. He holds the same position at Barnard College.

Dr. Chittenden is, by request of Prof. F. Lindermann of Munich, translating and editing his edition of Clebsch. This is the classic work on Analytical Geometry and the Theory of the Binary Forms.

J. M. Goodell is Assistant Secretary of the American Society of Civil Engineers.

'85. A. D. Risteen has written a valuable treatise on the Molecular Theory.

'92. William Nelson has left the Westinghouse Electric Co. and is now with Washburn & Moen.

H. M. Southgate has been transferred to the Boston office of the Westinghouse Company. He was formerly in the testing department of that company at Pittsburg.

'94. W. B. Fuller is teaching manual training in Saco, Me.

'95. Harry D. Temple is inspecting conduit construction in this city.

Wm. O. Wellington is working on the new Boston Subway.

Seymour A. Farwell is a milk inspector at Boston.

J. Warren Thayer is with the Garvin Machine Co. of New York City.

A. D. King is with the Draper Machine Tool Co., Gold St.

COLLEGE NOTES.

The Committee on Intercollegiate Debates, appointed by the American Whig and the Clio-sophic societies of Princeton, has been arranging debates with Yale and Harvard. December 6 has been agreed upon with Yale. The question submitted to Yale is: "Resolved, That it would be wise to establish, in respect of all State legislation of a general character, a system of referendum similar to that established in Switzerland." Professor Hinton and Professor Warren have been conducting experiments with a view to testing the speed of a baseball pitched under normal conditions. A distance of sixty feet was measured off, and by means of an electrical attachment in the pitcher's hand and another in the catcher's the exact time of the ball in transit was read off a chronoscope. Captain Bradley and Pitcher Altman, of the Varsity Baseball Club, pitched a number of times, but owing to the cold weather and the lack of practice by the pitchers the speed was slightly under the normal rate. The observations show that Altman's speed, under the conditions given, was six-tenths of a second, while Bradley threw a ball .59 of a second. Profs. Hinton and Warren hope to measure the speed of the chief pitchers in the country.

The faculty of Lehigh has announced a new system of dealing with absences from college exercises. Of the first class, comprising general exercises, such as church, morning chapel and gymnasium, there will be allowed thirty absences during the first term and fifty during the second term. Of the second class, comprising recitations, lectures, laboratory exercises, etc., no absences will be excused. Any student having a certain percentage of absences in any subject, to be known as the "total exclusion standard," will not be allowed to take the final examination in that subject, but must repeat it with the next class. A smaller percentage of absence, to be known as the "partial exclusion standard," will debar a student from re-examination if he fails in the first examination. It has also been an-

nounced that a third examination in any subject will not be granted.

The triennial catalogue of Yale graduates and former officers has just been issued. It gives a complete list of all persons connected with the university since its foundation in 1701. The total number of graduates is given as 16,737, of whom 7,758 are dead and 8,952 survive. The total number of graduates of the various departments is summarized as follows: Academic department, 11,572; medical, 1,100; law, 1,061; scientific, 2,848; divinity, 710. The remaining number is composed of graduate, art and music students and recipients of honorary degrees. There are now 125 students in the medical school against 100 last year. It has been decided this week by the faculty that hereafter diplomas will be awarded to those who complete the courses in music. These courses include work on the violin, piano and organ.

Manager Irish of Williams has arranged the following schedule for the season: Saturday, October 19, Syracuse University at Williamstown; Wednesday, October 23, Yale at New Haven; Saturday, October 26, Crescent Athletic Club at Brooklyn; Saturday, November 2, Amherst at Amherst (championship game); Wednesday, November 6, Laureates at Troy; Saturday, November 9, Union at Albany; Saturday, November 16, Dartmouth at Williamstown (championship game).

At Amherst the Advisory Committee on athletics has authorized the raising of \$1,100 to meet the expenses of the football season. No class can put a team in the field to compete with outside teams until its manager has deposited with the Athletic Board its proportionate part of the subscription called for from the college for the corresponding athletic team during that season, and no games shall be arranged for class teams that shall in any way interfere with the college teams.

The historic old pine which has held so firm a place in Dartmouth's affections for many years was cut down in the vacation. The tree had lost one of its principal limbs in a violent storm, and the part that survived was dying slowly. It undoubtedly dated back to a period earlier than the foundation of the college, in 1769. The tree is now in the sawmill, and its timber will be used in constructing a chair for President Tucker and a mantle for the new Butterfield Museum.

A football and baseball league for the freshman classes of Dartmouth, Williams and Amherst has recently been proposed.

The young women of Tufts are organizing a Glee Club under the direction of Leo R. Lewis.

C. L. GORHAM & CO.,

DEALERS IN

FINE ∴ PIANOS.

ORGANS, MUSICAL MERCHANDISE AND
SHEET MUSIC IN GREAT VARIETY.

All popular sheet music and songs of the day just half
price. Banjo and Guitar strings equally cheap.

454 Main Street.

THE HORACE PARTRIDGE CO.,

335 Washington Street,
BOSTON.

Athletic Supplies of every Description.

Outfitters to W. P. I. Football Team,
SEASON OF '94.

All orders will have our most careful and prompt atten-
tion. Send for our illustrated catalogue.

A. I. GARDNER, W. P. I. '89.

Attorney-at-Law,
and
Solicitor of **PATENTS.**
LOAN & TRUST BUILDING,
WASHINGTON, D. C.

KYES & WOODBURY, ARTISTS AND ENGRAVERS,

84 PARK AVENUE,
WORCESTER, MASS.

WORCESTER ELECTROTYPE

— AND —

Photo. Engraving Co.,

10 BARTON PLACE,
WORCESTER, MASS.

ALSO NICKEL PLATERS.



STOP AT THE COMMONWEALTH HOTEL,
Worcester, Mass. F. G. MARDEN & Co., Proprietors.
Two Minutes from Union Depot. Rates, \$2.00 and \$2.50 per day.
Billiard Room. Steam Heat. Electric Light. Sample Rooms. Baths.

C. W. CLAFLIN & CO.,

DEALERS IN ALL KINDS OF

Anthracite and Bituminous Coal.

Also, all kinds of Wood and Kindlings.

Offices, No. 375 Main Street and at Yards, Shrewsbury
Street and Union Street, cor. Central.

TELEPHONE, No. 617-3.

BICYCLES.

Call and see them and see for yourself if they are
not the best. Prices to suit all.

REPAIRING AND LETTING.

WM. KRAEVE, Agent,
NEW RELIABLE HOUSE, - - 212 MAIN STREET.

WESBY'S BINDERY

Does every description of rebinding
and repairing at reasonable prices.

Office, 387 Main Street,
WORCESTER, MASS.

GO TO . . .

EASTON'S,

COR. MAIN AND PLEASANT STREETS,

for your

STATIONERY.

THE WARE-PRATT CO.
CLOTHIERS, TAILORS,
 Hatters and Furnishers,
 408-410-412 MAIN ST.,
 WORCESTER, MASS.

H. F. A. LANGE
 ↗ Floral Decorator, ↖
 294 Main St., Worcester, Mass.,
 Keeps constantly in Stock

FANCY ROSES AND FINEST ASSORTMENT
 OF CUT FLOWERS,
 Which he will arrange in Designs of any kind.
 Decorating Parlors and Halls a Specialty.

THE SCIENTIFIC AMERICAN.
 ~~~~~  
 THE MOST IMPORTANT  
 Engineering Works, Mechanisms and Manufactures  
 are represented and described in the  
**SCIENTIFIC AMERICAN.**  
 The *Scientific American* should have a place in  
 all professions.  
 Try it. Weekly, \$3.00 a year.

**BEMIS & CO.,**  
**BOOTS, SHOES AND RUBBERS.**  
 All the Latest Novelties in  
 FOOTWEAR.  
 421 and 423 MAIN STREET,  
 WORCESTER.

**C. C. LOWELL,**  
 (Successor to J. C. WHITE.)  
 HEADQUARTERS FOR  
**Mathematical \* Instruments**  
 And **ARTIST MATERIALS.**  
 ALSO, FULL LINE OF  
**PAINTS, OILS, GLASS, and VARNISHES.**  
 12 PEARL ST., opp. Post-Office.

BARTON PLACE,  
 WORCESTER.

*The Felt Print*

FINE JOB PRINTING  
 OF . . . .  
 EVERY DESCRIPTION  
 PRINTERS OF ILLUSTRATED  
 MATTER

**L. W. PENNINGTON,**  
 Designer, Manufacturing Jeweler, and  
**DIAMOND SETTER.**  
 Badges and Emblems Made to Order.  
 Gilding, Acid Coloring and Oxidizing, Repairing, Etc.  
 Old Gold and Silver Purchased.  
 397 MAIN STREET, WORCESTER, MASS.

**WM. S. SMITH & CO.,**  
 DEALERS IN  
**Hardware and**  
**Building Materials,**  
 Carpenters' and Machinists' Tools,  
 ALSO DRAWING INSTRUMENTS.  
 171 Main St., Worcester, Mass.

THIS SPACE TO LET.

FRED. W. WELLINGTON & CO.,

Wholesale and Retail Dealers in

**COAL.**

GENERAL OFFICE,

416 MAIN ST., - WORCESTER, MASS.

Branch Office, 600 MAIN STREET.

COAL POCKETS,

NORWICH, - CONN.

RETAIL YARD,

Southbridge, cor. Hammond St., Worcester, Mass.

1839.

Established.

1839.

LARGEST STOCK AND LOWEST PRICES

AT

S. R. LELAND & SON'S,

446 Main St., Worcester.

Agents for the Celebrated A. C. Fairbanks, L. B. Gathcomb, Luscomb & Stewart Banjos, Washburn, Vega, Bruno & Stratton Guitars, Washburn, Vega, Stratton, &c., &c., Mandolins.

All goods are fully warranted and exchanged if not satisfactory.

—HIRE YOUR—

**HACKS AND TEAMS**

AT

**HARRINGTON & BRO.'S,**

35 CENTRAL STREET.

**A. F. BRAGG,**

**TEMPERANCE DRINKS,**

**CIGARS AND TOBACCO,**

322 Main Street, - - Worcester, Mass.

THIS SPACE TO LET.

E. A. DICKIE,

**Baggage Express.**

ORDER SLATE,

9 Pleasant Street.

THIS SPACE TO LET.

# W. W. LEWIS,

Successor to Lewis & Emerson.

Wholesale and Retail STATIONER, BLANK BOOK AND PAPER Dealer. All kinds of PRINTING, BLANK BOOKS made to order, also complete line of TEACHERS' and SCHOOL SUPPLIES.

No. 505 MAIN STREET, WORCESTER, MASS. TELEPHONE 278-4.  
DRAWING PAPER IN SHEETS AND ROLLS.

## GLOBE HALL BILLIARDS,

C. M. HERRICK, Proprietor.

No. 10 Pearl St., two doors from Main.

Light, roomy and convenient. EIGHT Billiard and Pool Tables.



## Richmond Straight Cut No. 1 Cigarettes.

CIGARETTE SMOKERS, who are willing to pay a little more than the price charged for the ordinary trade Cigarettes, will find THIS BRAND superior to all others.

These cigarettes are made from the brightest, most delicately flavored and highest cost Gold Leaf grown in Virginia. This is the Old and Original Brand of Straight Cut Cigarettes, and was brought out by us in the year 1875.

BEWARE OF IMITATIONS, and observe that the firm name as below is on every package.

ALLEN & GINTER,

THE AMERICAN TOBACCO COMPANY,  
Successor, Manufacturer, RICHMOND, VIRGINIA.

## BAY STATE HOUSE.

Ranking with best of First-Class Hotels of New England, reorganized and will be conducted on a

### First-Class Basis

In every particular. Passenger Elevator, Well-Furnished Rooms and all heated by Steam.

FRANK P. DOUGLASS,

Proprietor.

JOHN A. SNOW,

Is Prepared to do all kinds of

## BOOT AND SHOE REPAIRING,

326 MAIN STREET,  
Opposite Mechanics Hall, up one flight of Stairs,  
Room 2.

LADIES' and GENTS' SEWED WORK a Specialty.  
Back and Front Stays and Toe Tips.

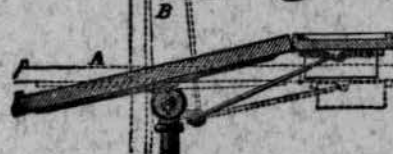
"DISCOUNT TO TECHS!"

## PATENT ADJUSTABLE STAND.

Fig 1



Fig 2



Send for Illustrated Circular.

PRICE, \$8 TO \$20.

—FOR THE—  
OFFICE, LIBRARY OR SITTING ROOM.  
FOR  
ARTISTS, ARCHITECTS, DRAUGHTSMEN AND SCHOOLS.

WASHBURN MACHINE SHOP,  
WORCESTER, MASS. M. P. HIGGINS, Superintendent.

Ladies and Gentlemen Looking for Fun and a Good Healthful Exercise,

CAN FIND IT AT

J. P. WHITE'S

Ten Pin, Billiard and Pool Room,

37 Pearl Street, Worcester, Mass.

Hours for Ladies: 9 A. M. to 4 P. M.

WE  
BUY  
OUR



HATS

FINE FURNISHINGS . . . . .  
AND ATHLETIC SUPPLIES

—OF—

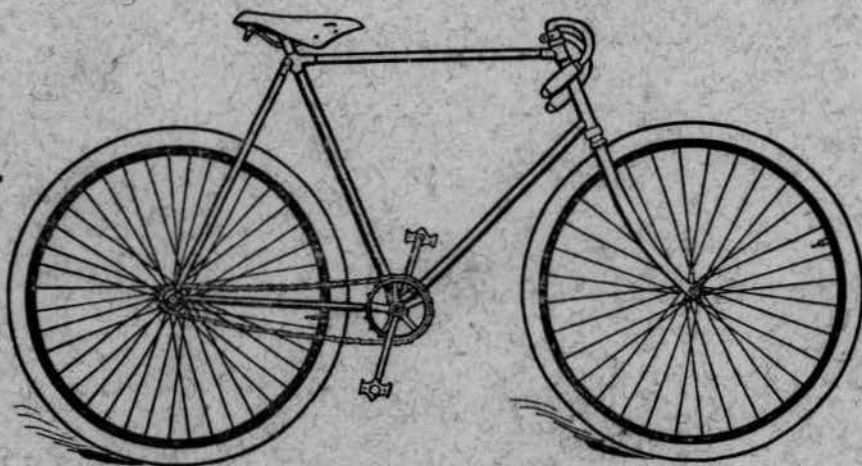
EDWARD B. CLAPP,  
365 MAIN STREET.

# BAY STATE BICYCLES.

WEIGHT 19 TO 22 LBS.

FULLY  
GUARANTEED.

—  
EASY  
PAYMENTS.



OLD  
WHEELS  
TAKEN  
IN  
EXCHANGE.

PRICE \$100.00.

THE RAMSDELL & RAWSON CO.,  
24 PLEASANT STREET.

L. W. RAWSON, Mgr. (W. P. I. '93).

**TOM WALTERS, Jr.,**  
CUSTOM SHIRT MAKER,

Hatter and Men's Outfitter.

DEAD! No, Only a drop in Prices.

PINAFORES AND APRONS

For the Chemists.

DRESS SUITS FOR THE MACHINE SHOP.

