ASTRONOMY

(Continued from page 66.)

but however much it has been improved, I cannot think those who were there in Prof. Holman's time would be willing to exchange their recollection of him for all the improvements.

If I should state a lack of training in my time, it was in not urging upper class students to consult physical periodical literature. Doubtless this has been remedied.

I have attended many meetings in which Tech men were praised, and the general note of praise is this: The Tech man is resourceful in an emergency. He has had a training broad enough to teach him to apply what he knows to other fields than those in which he learned it. If a man learns this he can make an astronomer or anything else of himself.

PHYSICS AND ENGINEERING

By LOUIS DERR.

(Continued from page 65.)

which have come under the writer's own observation.

Every student knows what limits the lift of a suction pump; but in a certain case a much more ambitious project involving a siphon got well beyond the preliminary stages before it was pointed out that the bend of the siphon was 35 feet above the reservoir. In another case, a bicycle track was to be built for indoor races, and the corners were banked according to the ideas of the carpenter in charge. A student of the Institute figured the banking necessary, obtained a result requiring a much steeper slope of the track at the corners, and, after a conference with the writer, reported his findings to the man in charge—and was laughed at. When the track was finished, the first trial piled rider and machine in a heap at the first corner, and the track had to be rebuilt, this time according to the ideas previously ridiculed. It was successful.

Even today perpetual motion devices appear. Most of them are simply frauds upon the unwary investor, but the writer was called in all seriousness a few years ago to examine a sort of geared flywheel which revolved easily in one direction and only with difficulty in the other, and the inventor hoped he had found a new force. The explanation of the action was that of the grip of a pipe-wrench, the parts wedging themselves together or loosening according to the directions of rotation, thus causing unequal friction.

The liquid air fallacy of a few years ago affords another illustration of the saving value of a knowledge of the principles of energy. Beginning with the experimental fact that liquid air in vaporizing to atmospheric temperature expands about 800-fold, it follows that a pressure of about 12,000 lbs. per square inch can be developed. This attractive figure was promptly seized upon, and thousands of shares were sold by promotors of stock companies advertising to propel engines, ships, locomotives, and power devices of all kinds by the new agent. A fairly simple calculation, however, will show that a gallon of liquid air represents only about three-fourths of a horsepower-hour, far less than it required to produce it, and only a small fraction of the energy of an equal weight of coal.

Electrical energy is another mystery to the untrained, and is still occasionally credited with an ability to produce something for nothing. A certain dynamo was to be driven by power purchased from an adjoining factory. It was demonstrated to the engine owner that the armature could be easily spun round by hand, and a small sum was agreed upon in payment for such a trivial amount of power; all, of course, before the lights were installed. Later, the fireman felt quite sure that more coal was needed when the dynamo was running; but the deception was not discovered until long afterwards.

These stories would be ridiculous if they were not true; the only purpose in inserting them is to show that the work of every day is seldom spectacular, but rather usually concerned with very simple problems, requiring above all else a thorough familiarity with fundamental principles.

SECONDARY SCHOOLS

By W. J. DRISKO.

In these days of conservation discussion it seems almost appalling to think that in all the industrial arts where coal is burned, only 8 or 10 per cent. of the total energy is utilized; but this waste is small compared with that due to the general inefficiency of human power applied in the industrial world. It is estimated that the industrial loss to the South due to the hookworm curse is over two billion dollars yearly; yet this is as nothing compared to the waste of human energy due to incomplete development. The lack of physical energy, and of interest, stupidity, dishonesty, intemperance, and vice in general, failure to appreciate the real joys of living and doing, all these, and scores of other human weaknesses, mainly due to lack of training, are eternally clogging the gears of the industrial mill. Since only 1 or 2 per cent. of all our school children ever reach college, it is clear that any reform brought about by school training must come from the grades, the high schools and the industrial schools; and as the measure of real success is the extent of the development of ones faculties and his bearing as a citizen and member of society, the real function of a public school is first to develop human power by giving the individual the most complete command of himself, and second, to give him proper co-ordination with his kind.

Judged by the standing of the very small percentage of our public school children who reach college, the system seems a success; but from the point of view of the fitness for life of the very large percentage, there is chance for great improvement, and the reform must come through better teaching.

In the public school this means adapting all the means and methods at hand to the varying needs of each of the unsifted, always keeping in the foreground the idea that the final product, though only a cog in the great industrial machine, must be the most skilled artisan, the keenest and best developed man of business, and the best rounded out citizen that it is possible for him to be.

The trained and educated teacher, then, is surely one of society's most important servants, and in no stage of the youth's development is the impress of the teacher so important and so permanent as during that portion of adolescence corresponding to the years in high school, and perhaps the earlier years in college. The coming teacher must teach from himself, and not from some school board-prescribed text-book. He must realize that every pupil is a special problem, to be solved with enthusiasm, encouragement, sympathy, and, above all, with tact, so that in every subject under consideration there will be a distinct appeal to each particular individual from his own particular viewpoint. He must also realize that all our fine school buildings, with their marble halls, elaborate systems of heating and ventilating, their statuary and paintings, the elaborate apparatus, highly developed pedagogical methods, and fine psychological discriminations, are all mere husks and symbols of real education. Our district school of the ancient type, wanting, sadly wanting in most of these pedagogical minutiae, shows pretty conclusively that the most essential thing in real education is the direct inspiring, human uplift of the real teacher.

The trend of thought among educators seems to be in the direction of greater emphasis on sciences and modern languages, with perhaps less attention to Greek and Latin. Our better high schools and academies are offering courses in mathematics, physics and chemistry, comparing very favorably with the average college course given in these subjects forty or fifty years ago, so that both the demand and the opportunity for good teachers of science in the secondary schools are very great. The salaries offered in such schools are in general better that the colleges offer, and promotion is much more rapid. For a man who has a fondness for teaching, and who has had the training given in Course VIII, a desire to be a factor in bettering our secondary school training would seem a very laudable ambition.

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