the cost over a year for coal only was 9.4s. per 1,000 gallons when the average cost of coal was 16s 10½d. per ton. Allowing for labor and repairs, the cost was 11.75s. per 1,000 gallons. On a month's test with coal at 13s. 3d. per ton the cost was 8.2s. per 1,000 gallons. The best day's test that I have had was with washed nut coal at 13s. per ton and of 13,800 B. Th. U. value, when the cost of evaporation per 1,000 gallons was 6.46s. on the net water, after allowing for the 7½ per cent. of the total water which was used for steam jets in connection with the stoker. The stoker itself was driven by an electric motor. With another type of stoker I have burned smudge coal costing 7s. per ton and of 10,400 B. Th. U. value, when the cost of evaporation was 3.82s. per 1,000 gallons. Various circumstances have combined which will, I believe, render a repetition of this figure impossible.

In carrying out experiments for practical use, care should be taken to ascertain beforehand that the samples and prices can be repeated in bulk, otherwise much time may be wasted. The capital cost, the working cost, and the maintenance of improvements must always be considered in connection with the saving to be effected by the alteration. For instance, I have known cases where condensing was applied under unfavorable conditions to a non-condensing plant, and the power taken in running the auxiliaries in connection with the condenser practically equalled the power saved on the main engines. This is not the reason why condensers have not been mentioned as possibly applicable and likely to effect a saving in existing plants; I have omitted them because generally the consideration of condensers, cooling towers, and the necessary auxiliaries in connection with them, would take more space than can be spared here, and their application would necessitate a greater upheaval of the existing conditions than I am contemplating.

Great economies may be effected in illumination by the use of the metallic filiment lamps now available, which also should especially appeal to those who find it necessary to extend the lighting circuits for new buildings, and are hampered by a fully-loaded plant. Approximate figures may be borne in mind indicating the difference between the two types—1 h.p.—200 c.p. with carbon-filament lamps or 500 c.p. with metal filaments. The two best known types at present on the market are the "Osram" and "Tantalum," taking 1.25 and 1.75 watts per candle-power respectively. An objection to the lamps which has not yet been overcome is the high price. The "Tantalum" can be fixed in any position, but the "Osram" must be placed vertical, while neither can yet be obtained for pressures above 130 volts. Higher pressure can only be used on these lamps in series, which is objectionable.

Gas Engine Engineers

By H. W. Jones in Gas Power.

Why is it that one man operating a 10 h.p. engine is called "engineer," and the man who controls a plant of 10,000 h.p. capacity and has under his care 500 human lives and many thousands of dollars of machinery, is also called "engineer?" There are many kinds of engineers—electrical, mechanical, civil, locomotive, mining, consulting, steam engineers, etc. Now we have a comparatively new kind—gas engine engineers. Many say gas engines do not need engineers. If a 10 h.p. gas engine does not need an engineer, does a 1,000 h.p. gas engine need one? If so, at what h.p. is the change made? And why?

I have met many men who operate gas engines; some are chief engineers in large buildings or in immense plants and some never saw a large gas engine. I believe no one will disagree when I say that the school of experience is the only one in which any engineer ever learns. (I mean any operator of engines.) A fireman on a locomotive must fire three to five years as a general thing before he gets an engine to run. A steam engineer's first and really most important duty is to see that his boilers are properly fired and properly cared for, this takes years of experience and study. Talk to a chief engineer of some big plant about plumbing, gas fitting, mill wrighting, electricity, hydraulics, the art of controlling men; talk pressures, strains, capacity of pipes, wires, or any question of dynamics; talk chemistry of coals, gases, etc., and we will find his conversation interesting; we will find he not only knows something of each subject, but that he studies them all so he can know more. They call this man an engineer, too.

If we had this kind of operators for all gas engines, in twenty years from date a steam engine would be a curiosity. Are we to continue to say gas engines do not need engineers? There is no kind, class, or grade of men that are needed more in the world to-day than gas engine engineers. This applies to the use of city gas, natural gas, producer gas, gasoline, alcohol, distillate, crude oil, or any other fuel. The underlying principle of operation is the same. But what that is, and why, written in A. B. C. language, is what we want to know.

Men who are operating gas engines have all kinds of opportunities to study, to experiment, to learn, and to advance in their line, whether it is chosen or forced by circumstances. What are we doing to advance the cause of our employers? Are we making a study of the engine? Are we getting the best out of it? Do we keep the engine up-to-date in cleanliness, and adjustments, or do we just "run" the engine haphazard? If we do, we should not be surprised when the new(?) engineer takes charge. And we should not be disappointed when we apply for the position of engineer to have the employer say: "Why this engine requires thus and so," and then tell us what is needed is just what we ought to have posted ourselves on—but didn't. Men on the farm, at the sawmill, or at any plant, no matter how large, or how small, growth is the watchword. Horace Greely said: "Go west, young man, and grow up with the country." The wisdom of the above was not the "Go west" part, but the "Grow up with the country." Take a job running a gas engine and grow up with the industry. If the plant we run is not growing as fast as we are, get another job and grow up with it. To see a man with trained hands is good; to see a man with trained head is also good. But when we combine both trained head and trained hands this is a combination that can't be beaten. Do we who are fortunate enough to be operating gas engines realize the field that is open for us? Do we realize our opportunities and are we getting out of them what we should?