

ENGINEERS' COMPETITION.

TORONTO, April 20th, 1891.

Editor CANADIAN ELECTRICAL NEWS.

DEAR SIR, The papers for the Engineers' Competition which you handed to us for examination have been carefully gone over by us, and as a result we have to report that Mr. A. E. Edkins, engineer at Messrs. T. Eaton & Co.'s, Toronto, is entitled to the first place, and that Mr. G. C. Mooring, engineer at the Methodist Book Room, Toronto, is entitled to second place. Mr. Edkins received 510 marks out of a possible 670, and Mr. Mooring was not very far behind, his losses being mainly in the answers to three questions.

We regret that so many engineers in the country did not avail themselves of this competition, as we are convinced a large number could have answered the questions with a little study.

We hope that at some future time you will see your way clear to give them another opportunity.

Yours very truly,

GEO. C. ROBB,

A. M. WICKENS.

The following table shows the number of marks obtained by each candidate:—

	Wm. Sutton.	G. C. Mooring.	A. E. Edkins.	E. Tipton.
No. 1	20	15	10	10
" 2	30	40	35	—
" 3	45	60	60	60
" 4	20	20	20	20
" 5	30	60	50	20
" 6	70	80	80	—
" 7	30	20	40	—
" 8	15	20	15	15
" 9	20	20	40	—
" 10	—	—	—	—
" 11	20	30	60	—
" 12	—	40	30	—
" 13	10	10	20	—
" 14	20	30	20	—
Neatness	10	—	30	—
Total	340	445	510	125

The questions submitted for solution in this competition and the answers given by Mr. Edkins, the successful competitor, are printed below.

1. What is a horse power as applied to a boiler?

Answer—The basis on which the H. P. of a boiler is rated is the evaporation of one cubic foot of water at 212° to steam, per H. P. per hour. This rating was established some time before the automatic cut-off engine came out, and when the actual consumption of engine was about that figure. In my opinion the term H. P. of a boiler is very vague, and depends on the relative economy or wastefulness of the engine. I believe that the modern high grade automatic cut-off engine, working non-condensing, will in ordinary practice develop two H. P. to every one H. P. at the above named boiler rating. The amount of heating surface in the ordinary tubular boiler which is necessary to evaporate one cubic foot of water is conceded to be 15 sq. ft., and it is generally allowed that that amount (15 sq. ft.) is equivalent to one H. P. in a tubular boiler, also 12 sq. ft. in a locomotive type of boiler, and 9 sq. ft. in a plain cylindrical boiler is equal to one H. P.

2. How much is gained if feed water can be had at 120° temperature instead of 40°?

Answer—7½ per cent. is gained.

3. With water at 40° fed into the boilers, and steam taken off at 90 lbs. pressure, how much coal should be required for each thousand gallons of water used?

Answer—1250 lbs. per 1,000 gallons, but I think in practice more than this would be necessary.

4. What would be the safe working pressure for a horizontal tubular boiler, 64 inches diam., 14 feet long, with 90 tubes, 3 in. diam., shell made of 60,000 lbs. steel plates ¾ in. thick, and double rivetted in longitudinal seams?

Answer—The safe working pressure is 98 lbs. per sq. in. (Reed's rule).

5. Give size of furnace for soft coal for such a boiler, and size of smoke pipe, and area and height of a chimney for a range of six boilers of same dimension?

Answer—Area of furnace, 2,475 sq. ft. = 4'6" × 5'6" Size of smoke pipe, 5'6" × 6'. Area of chimney, 30 sq. ft. Height, 100 ft.

6. An engine has cylinder 18 in. diam., and 18 in. stroke, and makes 240 revolutions per minute. Steam is supplied at 90 lbs. pressure in boilers 30 ft. away. What size should steam pipe be?

Answer—Size of steam pipe should be 6".

7. With steam cut off in above engine at ¾ in. of the stroke, and discharged into a heater open to the atmosphere, what horse power can be got?

Answer—I find by building a theoretical card under these conditions, that I get a M. E. P. of 34 lb. and 194 H. P.

8. If a condenser be added, maintaining a vacuum of 26 in. on the gauge at the condenser, what additional power could be got from engine?

Answer—By adding a condenser would gain 20 per cent.

9. What difference to the amount of fuel per horse power per hour should there be between above engine using a heater giving water at 190° and using a condenser, maintaining a vacuum of 26 in., and supplying feed water at 100°?

Answer—There will be a difference of 55 lbs. of coal per H. P. in favor of condensers.

10. If engine speed varied while the pressure of steam and load were constant, what should be done to remedy the defect?

Answer—There are several things that would cause an engine to vary in speed, under these conditions, for instance. The centrifugal force of the fly balls of governor not being correctly counter-balanced, the fly wheel might not be of sufficient weight, the governor belt might not be sufficiently tight to prevent slipping.

11. In a high speed automatic cut-off engine, what is the effect of the weight of the reciprocating parts on the steadiness of motion?

Answer—The effect is to equalize the pressure on the crank pin this way. During the first half of the stroke the reciprocating parts are being rapidly accelerated in motion, and while such is the case, they absorb considerable of the work done by the pressure of the steam on the piston, and, after mid stroke, give off this same amount of work on the crank pin in coming to rest. All the work done on the piston (minus friction) is transmitted to the crank pin, but the crank pin is protected from the tremendous blow which it would otherwise receive when steam is admitted to cylinder, by the weight of the reciprocating parts and for these reasons I would say, the effect is to equalize the pressure on crank pin.

12. The duty of the governor is said to be to regulate the speed; upon what conditions does its power to regulate depend?

Answer—Upon the governor balls being properly counterbalanced, and the fly-wheel being of sufficient weight, also that governors be kept in a proper state of lubrication.

13. What are the advantages of "compression" in the steam cylinder?

Answer—The advantages are that when properly utilized it can be made to fill the clearance space at initial pressure, and if this is done, there is no great loss by clearance. It also forms an elastic cushion, and this assists to bring the piston easily to rest at the end of each stroke. It also, when properly used, prevents the piston from sustaining any shock, when steam is admitted to cylinder, and in performing these functions, it tends to make an engine run easily and smoothly.

14. Describe the defects in the annexed diagram, and state what should be done to remedy them.

Answer—It is card indicates that everything is late opening and closing. I would put the eccentric forward the necessary amount. It is possible that the steam pipe, or ports, or exhaust pipe or ports, are too small; judging from card I would say they are.

The answers given by Mr. G. C. Mooring, the winner of the second prize, are as follows:

No. 1. Watts' standard, one cubic foot of water evaporated in one hour; but of later date, and with an automatic engine, 30 lbs. evaporated per H. P. per hour.

No. 2. 7½% saving.

No. 3. If 70% of the heat in the coal can be utilized, it would require 1,160 lbs. of coal per 1,000 gallons of water.

No. 4. 98.437 lbs.

No. 5. Rate of heating surface to grate surface, 45 sq. ft. to 1, equals 26 sq. ft. Smoke pipe connection, 27 sq. ft. area. Chimney, 110 ft. high, 33 sq. ft. area.

No. 6. Steam pipe, 6".

No. 7. 230.46 H. P.

No. 8. 25% additional power.

No. 9. Saving of fuel, 8%.

No. 10. Make the governors work right.

No. 11. They assist the governors.

No. 12. Upon its being properly balanced in proportion to its work, and to be kept clean and well oiled in every part, allowing it to regulate the valve or valves with the highest variation of speed.

No. 13. It forms a cushion to ease the engine off centres and partly fills the ports, thereby saving live steam.

No. 14. The valves are late in all their movements. Advance the eccentric.

RECENT CANADIAN PATENTS.

No. 36074. John Platt, Removing incrustation.

No. 36075. " Cleaning boiler.

No. 36094. M. Swinbourne, Ball valve.

No. 36098. G. E. Hitch, Storage battery.

No. 36116. Jos. Burns, Hydro carbon burner.

No. 36135. E. R. Gill, Electric circuit controlling apparatus.

No. 36195. E. Fales, Generating steam.

No. 36196. P. Fitzgibbons, Boiler.

No. 36214. H. Patterson, Steam boiler.

TRADE NOTES.

It is at this period of the year that the engineer's thoughts sorely turn to remembrances of heated axles, hot boxes and such; and he sadly wonders: a heated axle can make life in this world so unbearable, what must it be in the hereafter? The engineer is necessarily a man of intelligence, of quick perception, and of a trained and disciplined mind. He is capable of judging a good thing when he gets it, and once he gets what he wants, no counterfeit fakes need apply. The engineer who is worried just now about hot boxes has not tried Spooner's Copperine, otherwise he would be wondering why earth should be unhappy while Heaven leaves us Youth and Love, and Spooner gives us Copperine.—Bobcaygeon Independent.