	Per Day	Sixteen Days
29 Officers	$2 27½	$1 055 04
5 Staff-Sergeants	0 90	72 00
7 Pay-Sergeants	0 80	89 60
14 Sergeants ..	0 70	156 80
21 Corporals, ...	0 60	201 60
345 Rank and file	0 50	2,760 00
421 Rations.....	0 17	1,145 12

Total, Pay and Subsistence, $5,480 16

In the one case, the cost of Pay and subsistence for the Battalion for eight days would be $3,600; and under the other, for 16 days, $5,480 16. It will thus be seen that while double the number, or sixteen days' drill, is secured by the latter system, the cost is only increased by one-half the sum required to drill the same Battalion for eight days.

I have the honor to be, Sir,
Your most obedient servant,
P. ROBERTSON-ROSS,
Colonel Commanding, and
Adjutant-General of Militia.

Head Quarters,
Ottawa, 15th March, 1872.

(To be continued.)

SIMPLE AND COMPOUND ENGINES.

That we have persistently written against the compound engine is a fact very well known to all our readers. We have opposed the system because extensively tried years ago and failed to give any results commensurate with the trouble and expense which it entailed. We have always urged that, in theory, steam can be used to more advantage if expanded in a single cylinder than if expanded in two or more cylinders, because, in the first place, the loss of pressure between the two cylinders (show by the fact that the diagrams of compound engines never "meet") is avoided; and because, in the second place, a far larger weight of metal must be passed over by the steam in a compound than in a non-compound engine. We have besides, in the compound engine, one cylinder which, when much power is required, must be of unwieldy dimensions; and, finally we have in practice the fact that not a single argument can be adduced to prove that compound engines, with all their extra weight, complexity, great first cost, and special liability to get out of repair, are a whit more economical in fuel than properly constructed simple engines. Of course any one can point to the fact that compound engines are now working much more economically than the non-compound engines built some years since. There is no room to doubt for example, that the engines of the *Adriatic*, which has just made her first voyage to America, are more economical than those of the *Persia* or the *Scotia* ever were in their best days; but this proves nothing in favor of the compound engine, although it proves a great deal in favor of high pressures and large measures for expansion. We have frequently carfully pointed out that if the same pressures and measures of expansion were used in two equally well made engines, the one simple, the other compound, no difference would be discerned in the consumption of fuel. The curious fact is, that although engineers and steamships proprietors are now in favor of nothing but the compound system, neither engineers nor proprietors have taken the trouble to ascertain by direct experiment whether our arguments are or are not sound. It would appear as though nothing were easier than to test a good simple against a good compound engine under like condition of pressure and cut off; but, easy as it is, the work has not been done, and until last Saturday it was impossible to find particulars of a single experiment instituted and carried out to settle this most important question. It is known that the Committee on Designs for Ships of-war recommended the general adoption of compound engines in our navy. Much praise is due to the Government, and their advisers, for undertaking an experiment which the commercial public would not—to decide the relative merits of compound and non compound engines as regards economy of fuel before they carried into effect the recommendation of the Committee on Designs. To make this experiment, two gunboats were selected, the *Swinger* and the *Goshawk*, both precisely alike as regards the hull, the sole difference lying in the propelling machinery. On Saturday, the 25th these boats were tested for speed and economy of fuel, and we shall now proceed to place the results before our readers. We may add that the information elicited by the experiment confirms to the fullest possible extent the accuracy of the opinions which we have expressed concerning compound and non compound engines.

The *Swinger* and the *Goshawk* are sister composite gunboats, each of 408 tons and 60 nominal horse-power, the engines being intended to work up to 360 indicated horse-power. The *Swinger* has simple engines by Messrs. Humphrys, Tennant & Co., two cylinders, 34in. diameter and 21in stroke actuating a single Hirsch screw, 9ft. diameter and 10ft. 2 I Sin. pitch. The draught of water at the time of trial was 6 ft. 7ft. forward and 10 ft. aft. The coal used was Nixon's navigation. The sea was quite smooth, the barometer stood at 30 deg. 3 min. The six hours trial consisted of a run of three hours from Plymouth, and one of three hours back. On the outward run the revolutions per minute were 115.39, average cylinder pressure, 15.58 lb.; vacuum, 26.1 in., indicated horse power, 362.73. On the homeward run the boiler pressure was 60 lb. revolutions, 115.97; cylinder pressure, 15 61 vacuum in forward condenser, 26. 1in. after condenser, 25. Sin.; indicated power, 365. The total quantity of coal burned during the trial was carefully taken. It amounted to 5,700 lb., or 950 lb. per hour, which, divided by the average power (363.85). gives 2.61 lb, per indicated horse-power as the consumption of coal. So much for the simple engines. Now let us see what was accomplished by the compound system,

The *Goshawk* is as we have stated, a sister boat to the *Swinger*, and her draught of water at the trial—which took place at the same time as that of the *Swinger*—was also 6ft. 7in. forward and 10ft. aft, care being taken to trim both vessels precisely alike. The *Goshawk* is propelled by compound engines by Messrs. Maudslay, Sons & Field, 60 horse-power nominal. The small cylinder is 28in. and the large cylinder 48in. in diameter, the stroke being 18in. They drive a Hirsch screw 9ft. in diameter and 9ft. 2¼ in. pitch, the smaller pitch being used to accommodate the shorter stroke of the engines. During the outward three hours' run the boiler pressure in was 60lb., the revolutions, 126.36, average pressure in small cylinder, 31.08 lb.; in low-pressure cylinder, 7.5 lb.; vacuum, 25.4in.; indicated power in high-pressure cylinder, 219.8; in low-pressure cylinder, 155.4; total, 375.2. On the return trip the boiler pressure war 60lb; revolutions, 125.8 per minute; pressure in small cylinder, 30.3 lb.; in large cylinder, 7.8 lb.; vacuum, 25.5in., indicated power in small cylinder, 213.3; in large cylinder 160.8; total, 374.1. Total consumption of coal, 5,852 lb., or 975.3 lb. per hour; and this divided by 374.7, give a trifle over 2.6lb. per horse-power. From this it will be seen that the consumption of fuel was practically identical in both engines. In one word, nothing whatever in the way of economy was gained by the adoption of the compound system. No more direct or conclusive testimony to the accuracy of the opinions we have advocated could possibly be found.

After six hours' trial the speeds of the gunboats were tested on the measured mile—two runs for each boat. The *Swinger*, non compound, made 10.14 knots average; the *Goshawk*, compound, made 10.419. The boiler pressure of the former, however, was only 60 lb., and revolutions 114 per minute, corresponding to a piston speed of 4.22ft. per minute, while the boiler pressure in the *Goshawk* was 62 lb., and the revolutions 127.5 per minute, corresponding to 382.5ft. per hour. We have not been able to obtain particulars of the power developed during this speed trial, but it is evident that, taking the boiler pressure as a measure of the power, the advantage possessed by the *Goshawk* can be fully explained without any reference to the construction of the engines. It probably lies in the fact that the pitch of the screw in the *Swinger* is rather too coarse, and so locks the engines up.

It will be seen that this experiment has not been carried out in a small scale. Engines working up to 375 horse power are quite large enough to prove the truth or falsehood of any opinion about the nature of steam. The results are definite, and prove as plainly as anything can be proved that there is no economical advantage whatever about the compound system, which is not equally possessed by its rival. The result of the experiment is just what we anticipated, and further experiments with larger engines will make the facts clearer and better known to the public.

HEAD QUARTERS,
GRAND FALLS. *May 28th*, 1872.

MR. EDITOR.—During a recent visit to the neighboring Republic, my wonder was particularly excited in regard to the meaning of "Republican simplicity." I found a country in which Peabody the good might not accept the well-merited compliment of a baronetcy, because inconsistent with republican institutions; overflowing, nevertheless, with honorary "Honorables," "Generals" "Captains" "Colonels" and "Professors," without end I found in their splendid hotels, in their furnuture, cookery, system of arrangement, &c., &c., a lacquering most decidedly Gothic, realizing the days of the Grand Monarque rather than those of John Endicott or George Washington. I found in the churches, the schools, the theatres, and even in the court of justice, the same gingerbread, and the same tinsel. I was particularly amused in their criminal courts, and sincerely lamented the great injury done to the clear understanding of the case by the absurdly technical language in which much of the evidence is given. On one occasion the poor jury were told that "the integuments were reflected from the thorax, and the costal cartilages laid bare, when a wound was found which had penetrated through the anterior mediastinum, and had involved the arch of the aorta.' In a case of alleged child-murder, a medical dandy swore, when asked for a plain opinion of the cause of death, "that it was owing to atalectasis and a general engorgement of the pulmonary tissue."