BRANDSTOFNAVORSINGSINSTITUUT

VAN SUID-AFRIKA

FUEL RESEARCH INSTITUTE

OF SOUTH AFRICA

TEGNIESE MEMORANDUM NO. 20 OF 1968.
TECHNICAL

REPORT ON CARBON-FLO TESTS.

OUTEUR:
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REPORT ON CARBON-FLO TESTS.

1. INTRODUCTION.

At the request of Carbon-Flo (Pty.) Limited the Institute carried out a number of tests on a Chevrolet engine on the bench.

The main features of Carbon-Flo as claimed by the makers are:

(a) Decreased petrol consumption,
(b) Increased output,
(c) Longer engine life and
(d) Smaller carbon deposits in the engine which are also softer than with pure petrol and consequently are more easily removed.

Note: Aspect (c) is not covered by this investigation.

2. SUMMARY OF REPORT AND CONCLUSIONS.

Several tests were run with both premium and regular grade petrols and repeated after various methods of treatment with Carbon-Flo pellets. The results of these tests are recorded in Tables No. 1 to 12.

The cylinder head of the engine was removed before the commencement of these tests and visually examined. It was removed again after all the tests had been completed and examined. Figure 1(a) shows the cylinder head before the tests and Figure 1(b) after the tests. As the carbon deposits on numbers 1 and 2 ports were heavier than on the other four, close-up photographs were taken of these two ports. Figure No. 2 shows these two ports before and after the tests.

The carbon deposits after the tests had a light brown colour and were very easy to remove. The difference is apparent from the photographs.

Twelve...../

Twelve days after the tests and with the cylinder head off, white crystals had formed on top of the pistons as can be seen in Figure No. 3(a). The deposits on the various pistons were, however, not all of equal size, that on piston No. 3 being the heaviest, followed by 4, 2 and 5 in decreasing order. Figure No. 3(b) shows a close-up of piston Nos. 3 and 2. The deposit on piston No. 3 was qualitatively analysed and found to contain lead and aluminium. The aluminium probably came from the aluminium pistons in the engine.

Some black material was found in the scratches in the cylinder walls which filled them up and made the wall smooth. In some of the scratches there was a white metallic substance.

The sump oil of the engine was drained after the tests with Carbon-Flo and was a greyish brown colour. On leaving the oil to stand a black sludge settled out.

Exhaust gas samples were taken during some of the tests and analysed. An Elliot exhaust gas analyser was also used for check purposes. The compositions of the exhaust gases are shown in Table No. 13.

In each of the tests using a premium grade petrol treated with Carbon-Flo the torque of the engine was less than with untreated petrol with a correspondingly lower power output especially at higher revolutions of the engine. Bearing in mind that all tests were run at full load performance it will be noticed that although there is a decrease in fuel consumption at higher speeds there is also a proportionate drop in torque and power output. This effect becomes more marked the more Carbon-Flo pellets are placed in the petrol. In Test No. 5 where the engine was run at full load and a constant speed of approximately 2,000 r.p.m. (see Tables No. 6 and 7 and Figure No. 6) it will be noticed that with 10 Carbon-Flo pellets which were immersed in 5 gallons of petrol for 24 hours the power output was less than with 42 pellets which were not immersed in petrol. Some tests were also run after washing the pellets in a 10 per cent solution of nitric acid. This had no apparent effect.

Using a regular grade petrol there was virtually no difference in the power output and fuel consumption when using 42

Carbon-Flo...../

Carbon-Flo pellets as compared with untreated petrol. In test No. 7(a) there was a slight increase in power output and fuel consumption at the higher revolutions of the engine but the atmospheric conditions during this test promoted a slightly higher volumetric efficiency. The humidity was 77.5 per cent on the day this test was run compared with 67.0 per cent on the day the untreated petrol test was run.

The results of the exhaust gas analyses do not show any appreciable difference between untreated petrol and petrol treated with Carbon-Flo both for premium and regular grades.

3. DESCRIPTION OF EQUIPMENT USED.

(a) Carbon-Flo.

Carbon-Flo consists of rectangular metal pellets 25mm x 25mm x 7mm thick. It is also available in the form of bars which are cast in such a way that they can be broken up into pellets. The makers specify that for engines with capacities of up to 2 litres, 16 pellets are required in the fuel tank and for engines over 2 litres capacity 20 pellets are required. It is stated that the pellets consist of lead, tin, antimony and mercury.

(b) Chevrolet Engine and Electrical Dynamometer Generator.

A 1955 model Chevrolet engine coupled to a D.C. Dynamometer was used for the bench tests.

The following is the specification of the engine:

Engine	Car Model
Cylinders	6 in line
Bore	3-9/16", (90.49 mm.)
Stroke	3-15/16", (100.20 mm.)
Displacement	$235.5"^3$, (3.859 litres)
Compression Ratio	7.3 : 1.

The load on the engine is altered by altering the field of the generator.

(c) General.

All instruments required for a comprehensive bench test were used in these tests.

4...../

4. THE TESTS.

(a) Exposure Tests.

Eight numbered pellets were weighed and placed in a clear glass bottle containing standard premium grade petrol and left in the bottle for 14 days. These were taken out, dried with compressed air and weighed again.

The weights were as follows:

No. of Pellet	Wt. Before Placing in Petrol - g	Wt. after 14 days in Petrol - g	+ = Gain in Wt. - = Loss in Wt.
1	27.5215	27.5419	+ 0.0204
2	24.5012	24.5191	+ 0.0179
3	27.4549	27.4158	- 0.0391
4	29.8565	29.8772	+ 0.0207
5	26.5127	26.5293	+ 0.0166
6	25.4813	25.4941	+ 0.0128
7	25.2147	25.2288	+ 0.0141
8	25.3046	25.3118	+ 0.0172

These pellets were not treated in a 10% nitric acid solution prior to being placed in the petrol. Contrary to expectations all pellets, but one, gained weight.

(b) Engine Tests.

For the size of the engine used the makers of Carbon-Flo specify that 12 pellets should be placed in the petrol tank or in the filter housing of an Adco filter inserted in the fuel line to the carburettor. Tests were done with 12, 24 and 42 pellets in the Adco filter with a premium grade petrol. For each set of tests, a test was also done with a straight premium grade petrol without the Carbon-Flo pellets for comparison purposes.

A similar series of tests was carried out with a regular grade petrol.

The amount of fuel consumed by the engine at different revolutions was measured automatically by a revolution and time counter taking the time to consume exactly 200 ml of petrol.

In...../

In order to obtain accurate readings of the fuel consumption at different revolutions of the engine, corrections were made for the density of the fuel at the various fuel temperatures. In all the tests the average ambient temperature, the average humidity and the average barometer readings over the time of the test were also taken into account and the necessary corrections made.

The tests were all run at full throttle and the speed was altered by varying the load on the engine.

The makers of Carbon-Flo initially requested the Institute to run these tests at engine speeds of 1,000, 2,000 and 3,000 r.p.m. Three trial runs were done at these speeds and it was then decided to run all the tests at speeds from 1,000 to 3,000 r.p.m. with increments of 500 r.p.m. In addition to the tests mentioned, one test was run at a constant speed of approximately 2,000 r.p.m. (Table Nos. 6 and 7 and Figure No. 6.) This figure was arrived at by taking the maximum point on the torque curve which is the speed at which the engine gives maximum torque.

In test No. 2 with a premium grade petrol and with 12 Carbon-Flo pellets in the Adco filter (Table No. 2 and Figure No. 4 the fuel pressure dropped considerably at speeds of the order of 2,500 r.p.m. and higher. This was probably due to the fact that the pellets obstructed the fuel flow. At 2,973 r.p.m. it was less than half the normal figure. A possible explanation for this could be that the pellets blocked the holes in the Adco filter at these speeds. The method of packing was changed in all the other tests to try and prevent this.

For each test the ignition timing was set to give maximum power with untreated petrol and this was kept constant for each set of tests with treated petrol.

The performance data of the engine are recorded in Table Nos. 1 to 12 and presented in Figure Nos. 4 to 10. Reference should be made to Appendix No. I regarding the data given in these tables.

In all the tests, the fuel consumption of the engine is presented in kg/min.

The...../

The exhaust gas analyses are presented in Table No. 13.

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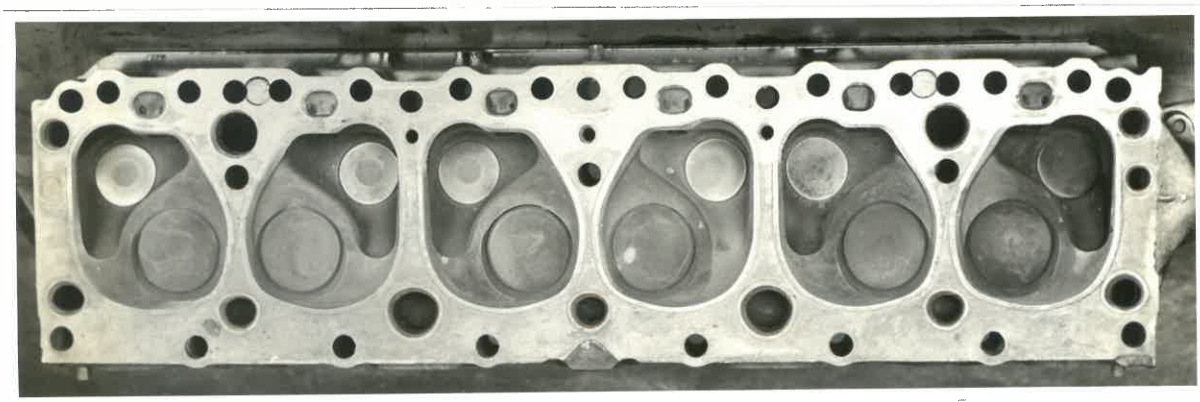
E.L. GERICKE.
Senior Research Officer.

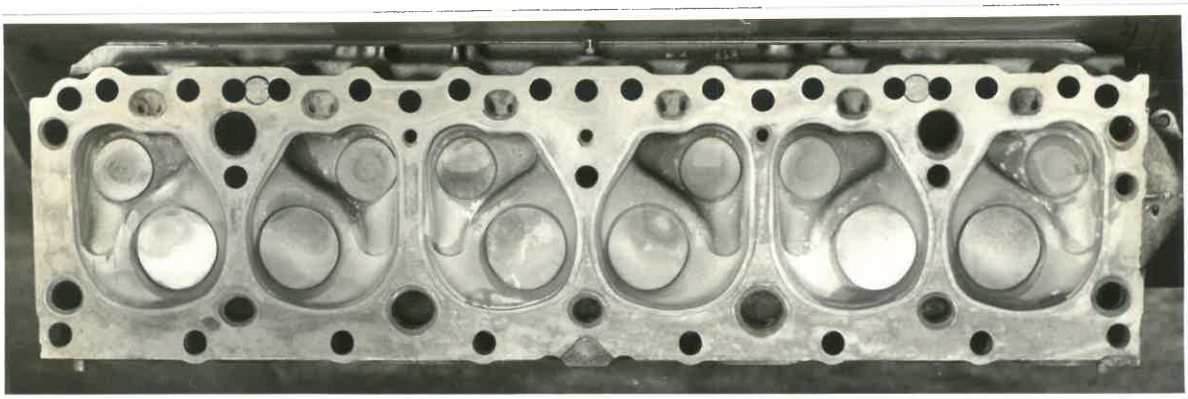
APPENDIX NO. I

Test No.	Grade of Fuel Used	Treatment	Remarks
1	Premium	None	None
2	Premium	12 Carbon-Flo pellets in Adco filter	See explanation for drop in fuel pressure at higher speeds.
4(a)	Premium	None	None
4(b)	Premium	24 Carbon-Flo pellets in Adco filter. Pellets washed in a 10% solution of HNO_3 before use.	None
4(c)	Premium	42 Carbon-Flo pellets in Adco filter. Pellets washed in a 10% solution of HNO_3 before use.	None
5(a)	Premium	None	Constant speed test. Approx. 2000 r.p.m.
5(b)	Premium	42 Carbon-Flo pellets in Adco filter.	Constant speed test. Approx. 2000 r.p.m.
5(c)	Premium	After 10 Carbon-Flo pellets had been immersed in 5 gallons of petrol for 24 hours.	Constant speed test. Approx. 2000 r.p.m.
5(d)	Premium	After 10 Carbon-Flo pellets had been immersed in 5 gallons of petrol for 24 hours.	Normal characteristic test.
7(a)	Regular	2 Carbon-Flo bars broken into pellets and placed in Adco Filter.	None
7(b)	Regular	42 Carbon-Flo pellets after vibrating in petrol for 8 hours.	Readings were taken on the run up to 3000 r.p.m. as well as down to 1000 r.p.m.
7(c)	Regular	None	Readings were taken on the run up to 3000 r.p.m. as well as down to1000 r.p.m.

FIGURE NO. 1.

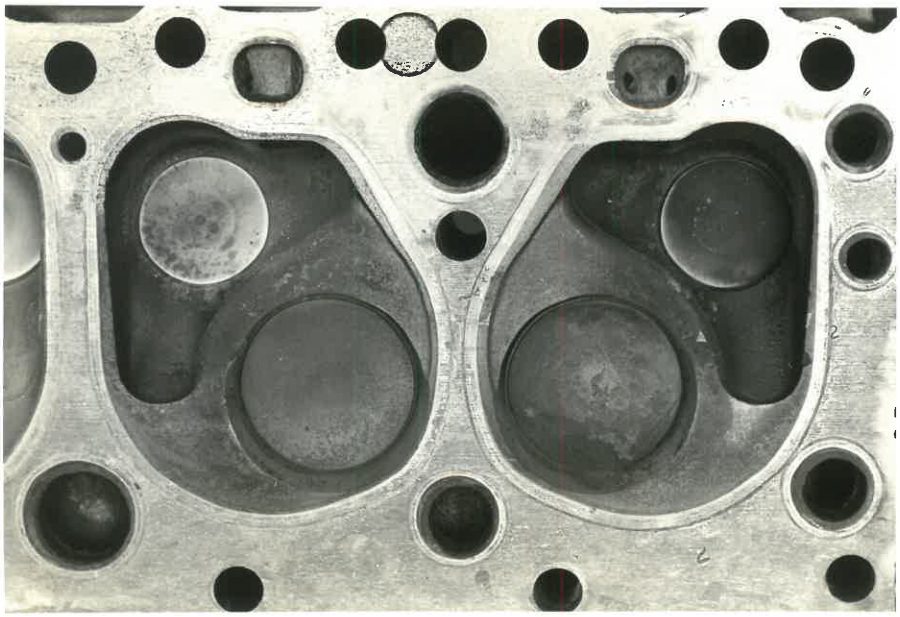


(a) The cylinder head before starting the tests showing the carbon deposits on the valves. Nos. 1 and 2 ports had the heaviest deposits.

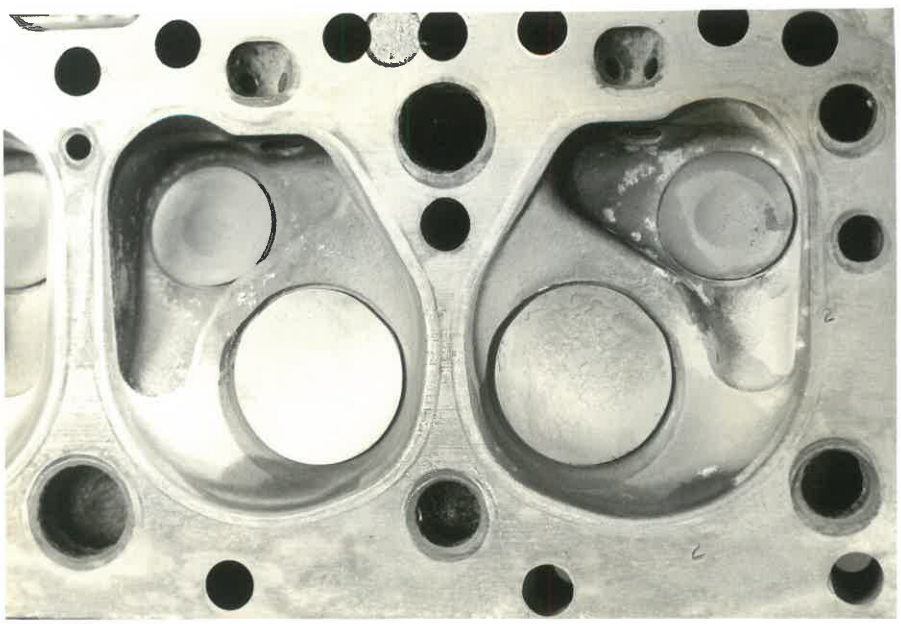


(b) The cylinder head after all the Carbon-Flo tests were completed. There was less carbon than at the start and the deposits were also much softer and more easily removed. The carbon had a light brown colour.

FIGURE NO. 2.

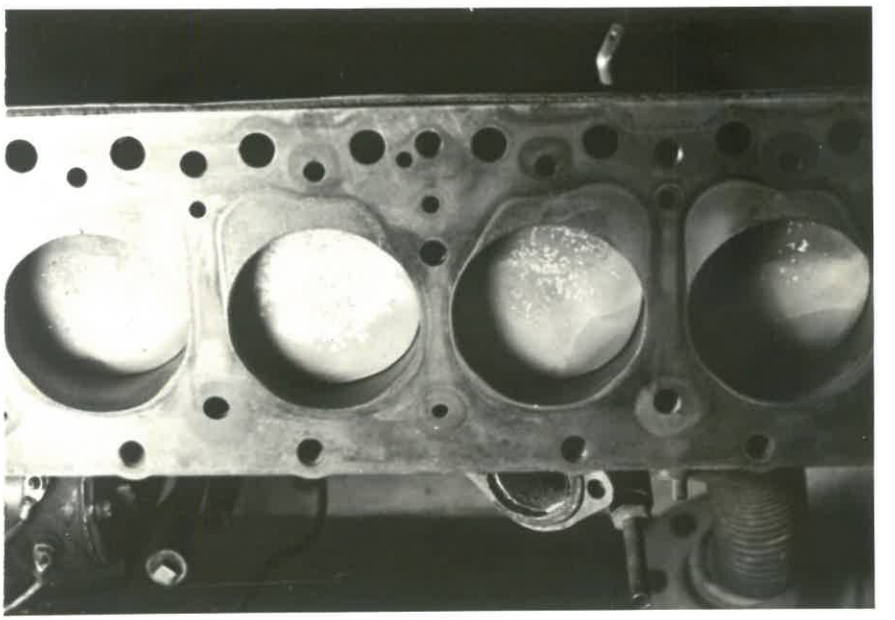


(a) A close-up photograph of Nos. 1 and 2 ports before starting the Carbon-Flo tests.

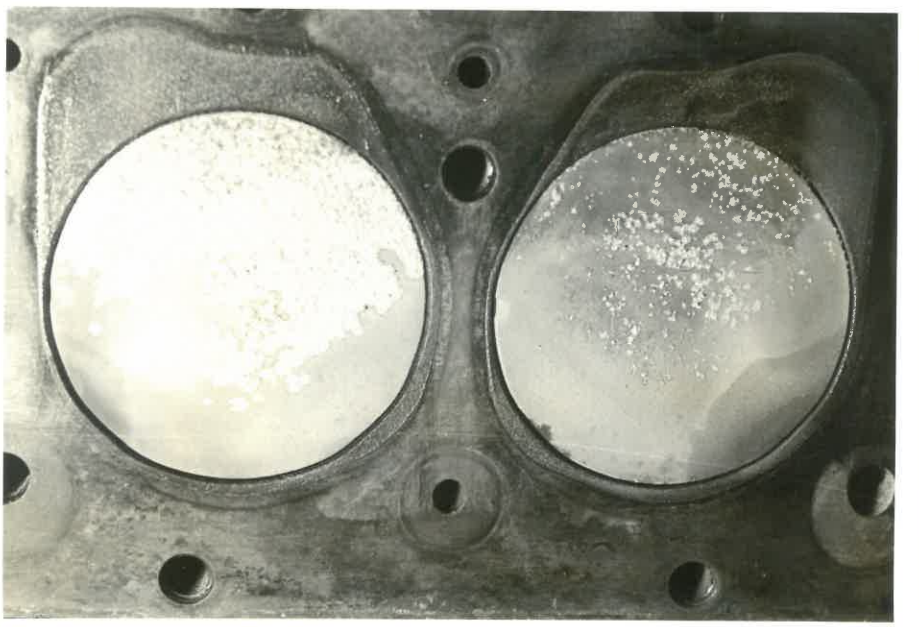


(b) A close-up photograph showing Nos. 1 and 2 ports after the Carbon-Flo tests had been completed. There is clearly much less carbon present.

FIGURE NO. 3.



(a) The cylinder head was removed on 1st March, 1968 the pistons being left open. By the 12th March, 1968 a deposit of white crystals had formed on top of the pistons. Piston No. 3 had the largest deposit of these crystals followed by 4, 2 and 5 on each of which the deposit became progressively less. There were only slight deposits on pistons No. 1 and 6. These are clearly shown on the above photograph.



(b) A close-up photograph of pistons No. 3 and 2 showing the white crystal deposits.

TABLE NO. 1.

PERFORMANCE OF A CHEVROLET ENGINE ON AN UNTREATED PREMIUM GRADE PETROL.

Times of Readings a.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. °C	Ignition Advance Degrees	Fuel Temp. °C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
10.40	1047	1.65	1.68	0.127	13.2	18.4	26.9	283	81.7	500	20	24.0
10.45	1373	2.07	2.10	0.162	13.0	18.8	36.0	270	78.1	490	23	24.0
10.50	1863	2.83	2.88	0.219	13.2	18.8	48.9	269	78.8	540	27	24.0
10.53	2400	3.60	3.66	0.280	13.1	18.3	61.3	274	77.8	600	34	24.0
10.56	3068	4.45	4.52	0.337	13.4	16.0	68.5	295	75.2	640	45	24.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 16 minutes

TABLE NO. 2.

PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL WITH 12 CARBON--FLO PELLETS IN FILTER.

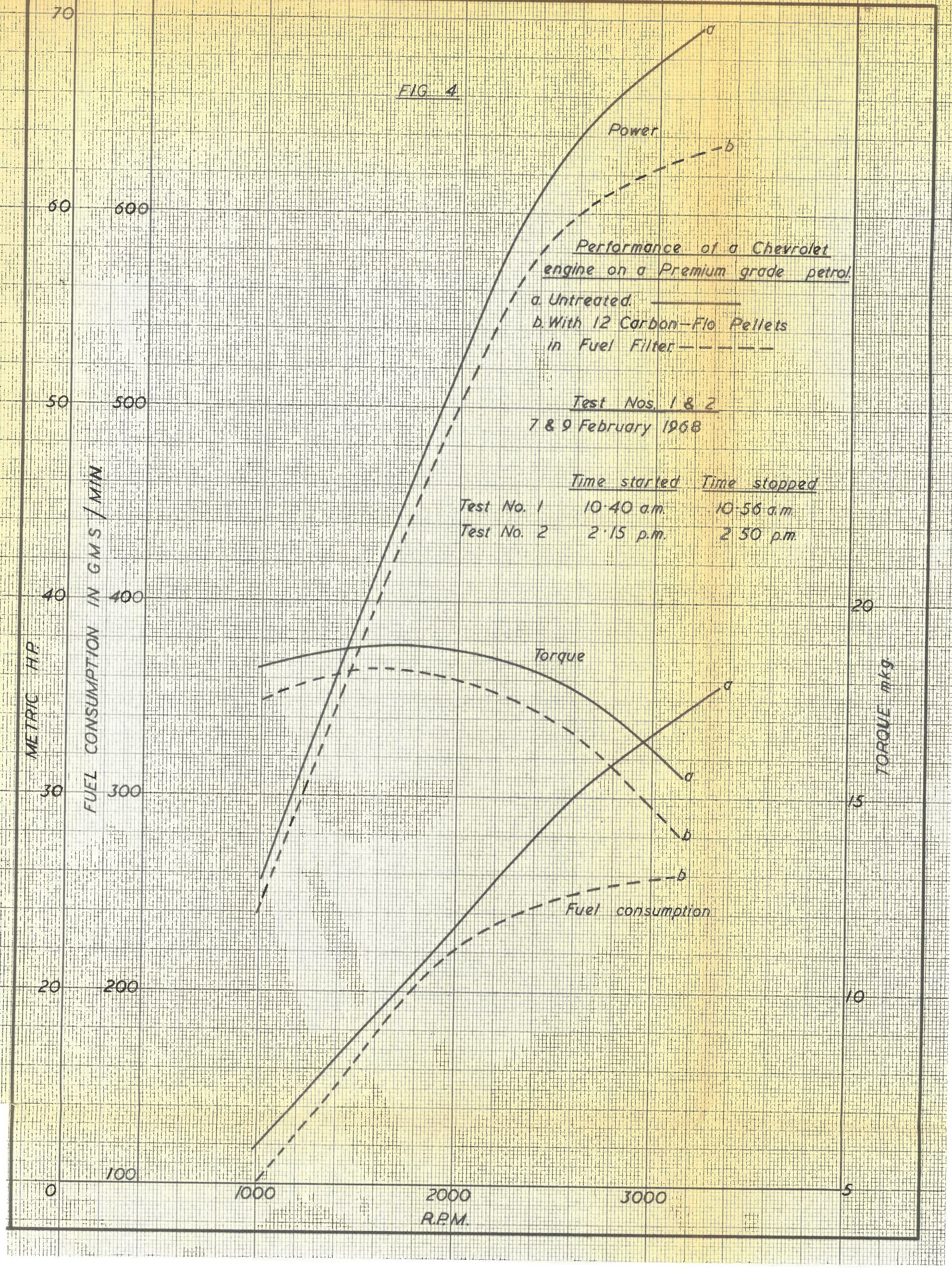
Times of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. °C	Ignition Advance Degrees	Fuel Temp. °C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
2.15	1021	1.60	1.60	0.105	15.2	17.5	24.9	253	81.2	440	20	31.0
2.25	1970	2.95	2.95	0.221	13.3	18.0	49.5	268	77.2	540	28	31.0
2.40	2973	4.25	4.25	0.259	16.4	15.0	62.2	250	74.1	650	45	32.0
2.45	2482	3.62	3.62	0.244	14.8	17.0	58.9	249	75.6	620	35	32.0
2.50	1460	2.10	2.10	0.151	13.9	17.9	36.5	248	74.4	510	24	32.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Orifice Intake Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 35 minutes

NOTE: This test was started at 2.15 p.m. after the engine had been running with 12 Carbon-Flo pellets since 12.30 p.m.

TABLE NO. 3...../

FIG. 4



Performance of a Chevrolet engine on a Premium grade petrol

a. Untreated. ———

b. With 12 Carbon-Flo Pellets in Fuel Filter – – – – –

Test Nos. 1 & 2

7 & 9 February 1968

	Time started	Time stopped
Test No. 1	10·40 a.m.	10·56 a.m.
Test No. 2	2·15 p.m.	2·50 p.m.

TABLE NO. 3.

PERFORMANCE OF A CHEVROLET ENGINE ON AN UNTREATED PREMIUM GRADE PETROL.

Times of Readings a.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
9.56	1020	1.55	1.58	0.126	12.5	18.9	26.9	281	78.7	480	18	24.0
10.02	1430	2.10	2.14	0.168	12.7	19.0	37.9	266	76.1	500	24	24.2
10.07	1970	2.97	3.03	0.223	13.6	19.05	52.4	255	78.1	560	28	24.2
10.13	2495	3.75	3.83	0.274	14.0	18.25	63.5	259	77.9	620	34	24.5
10.20	2932	4.40	4.49	0.290	15.5	16.25	66.5	262	77.8	660	43	24.5

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test 24 minutes

TABLE NO. 4.

PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL WITH 24 CARBON-FLO PELLETS IN FILTER.

Time of Readings	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
10.50	1052	1.60	1.62	0.123	13.2	18.7	27.4	269	78.8	460	21	26.0
11.00	1434	2.14	2.17	0.163	13.3	18.6	37.2	263	77.3	500	24	26.0
11.09	2010	2.93	2.97	0.229	13.0	18.6	52.2	263	75.5	570	29	26.0
11.15	2485	3.65	3.70	0.275	13.5	17.7	61.4	268	76.1	620	35	26.2
11.20	2958	4.23	4.29	0.300	14.3	15.6	64.4	280	74.1	660	44	27.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 24 minutes.

NOTE: Carbon-Flo pellets were washed in a 10 per cent solution of nitric acid immediately before use.

TABLE NO. 5...../

TABLE NO. 5.

PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL WITH 42 CARBON-FLO PELLETS IN FILTER.

Time of Readings	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
12.00	1033	1.55	1.57	0.116	13.5	17.9	28.5	244	77.7	440	20	29.0
12.10	1400	2.05	2.07	0.152	13.6	18.0	35.2	259	75.9	490	24	29.0
12.14	2016	2.97	3.01	0.231	13.0	18.1	50.9	272	76.3	560	30	29.0
12.18	2444	3.55	3.60	0.271	13.3	17.6	60.0	271	75.3	600	35	29.0
12.20	2933	4.15	4.20	0.285	14.7	15.6	63.8	268	73.3	640	44	29.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52

Air Intake Orifice Diameter : 75.4 mm.

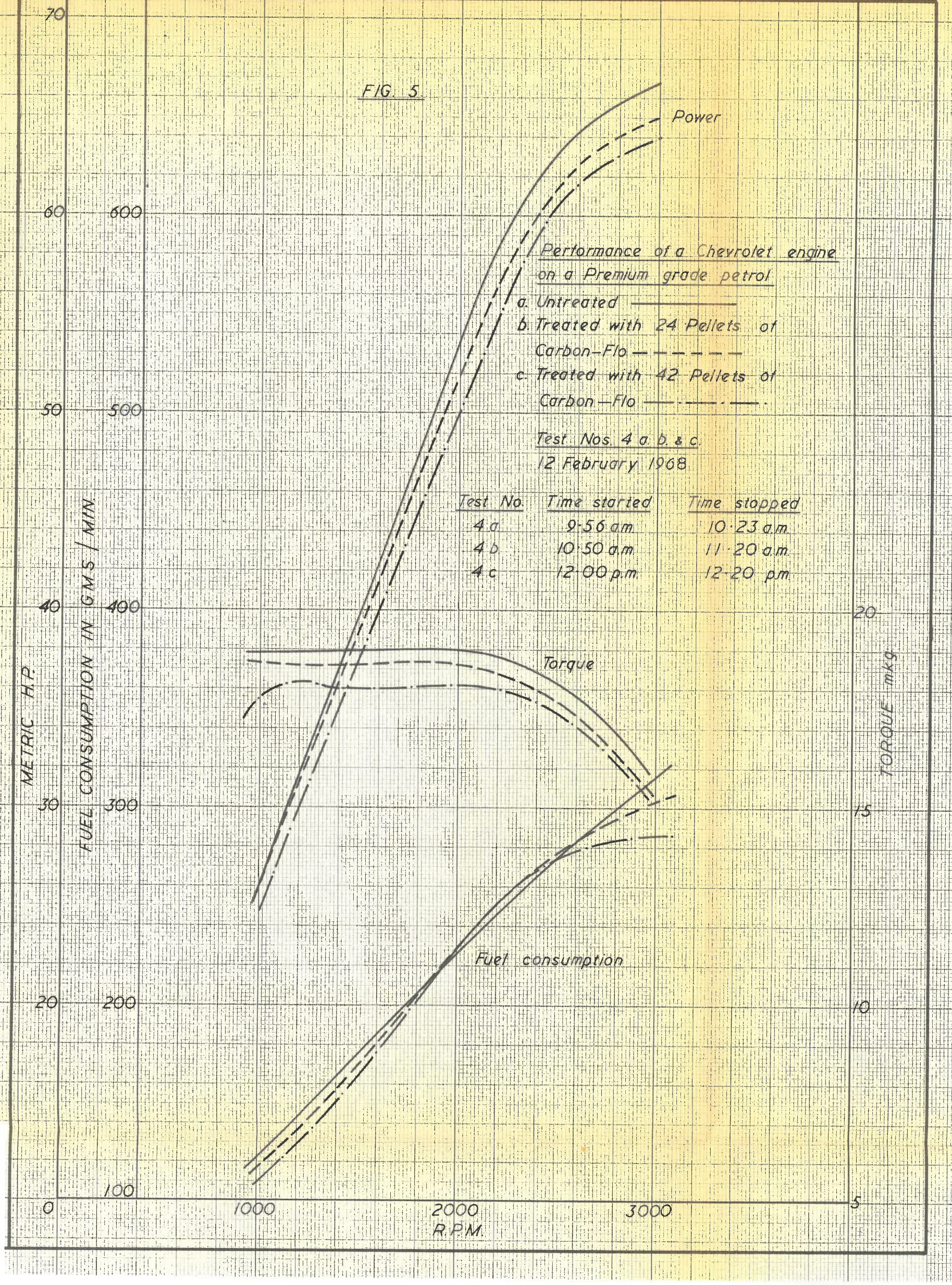
Compression Ratio : 1 : 7.3

Total time of the test : 20 minutes.

NOTE: Carbon-Flo pellets were washed in a 10 per cent solution of nitric acid immediately before use.

TABLE NO. 6...../

FIG. 5



Performance of a Chevrolet engine on a Premium grade petrol

a. Untreated ————————

b. Treated with 24 Pellets of Carbon-Flo – – – – – –

c. Treated with 42 Pellets of Carbon-Flo —·—·—·—

Test Nos. 4 a. b. & c.

12 February 1968

Test No.	Time started	Time stopped
4 a	9·56 a.m.	10·23 a.m.
4 b	10·50 a.m.	11·20 a.m.
4 c	12·00 p.m.	12·20 p.m.

TABLE NO. 6.

PERFORMANCE OF A CHEVROLET ENGINE ON AN UNTREATED PREMIUM GRADE PETROL AT A CONSTANT SPEED OF APPROXIMATELY 2,000 R.P.M.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. °C	Ignition Advance Degrees	Fuel Temp. °C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
2.10	1881	2.85	2.89	0.222	13.0	18.8	49.3	270	78.5	560	30	27.0
2.12	1934	2.93	2.97	0.227	13.1	18.8	50.7	268	78.5	570	31	27.0
2.15	1964	3.00	3.05	0.228	13.4	18.8	51.5	266	79.1	570	31	27.0
2.20	1990	3.00	3.05	0.231	13.2	18.8	52.2	266	78.1	570	31	27.0
2.25	2037	3.07	3.12	0.239	13.1	18.8	53.4	269	78.1	580	31	27.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of test : 15 mins.

TABLE NO. 7.

PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL WITH 42 CARBON-FLO PELLETS IN THE ADCO FILTER AT A CONSTANT SPEED OF APPROXIMATELY 2,000 R.P.M.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. °C	Ignition Advance Degrees	Fuel Temp. °C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
2.32	2102	3.15	3.18	0.241	13.2	18.6	54.5	265	77.6	590	32	28.0
2.45	1951	2.90	2.93	0.217	13.5	18.5	50.4	258	77.0	570	31	28.0
2.50	1976	2.93	2.96	0.218	13.6	18.5	51.0	257	76.8	570	30	28.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of test : 18 minutes.

TABLE NO. 8...../

TABLE NO. 8.

PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL AFTER 10 CARBON-FLO PELLETS HAD BEEN IMMERSED IN 5 GALLONS OF PETROL FOR 24 HOURS AT A CONSTANT SPEED OF APPROXIMATELY 2,000 R.P.M.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
3.05	1937	2.92	2.94	0.217	13.5	18.4	49.7	262	78.1	560	30	28.0
3.15	1980	2.94	2.96	0.222	13.3	18.3	50.5	264	76.9	560	30	28.2
3.20	2005	2.96	2.98	0.224	13.3	18.3	51.2	263	76.5	580	25	28.2

Carburettor Main Jet Diameter : 1.33 mm. No.52
Air Orifice Intake Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of test : 15 mins.

TABLE NO. 9.

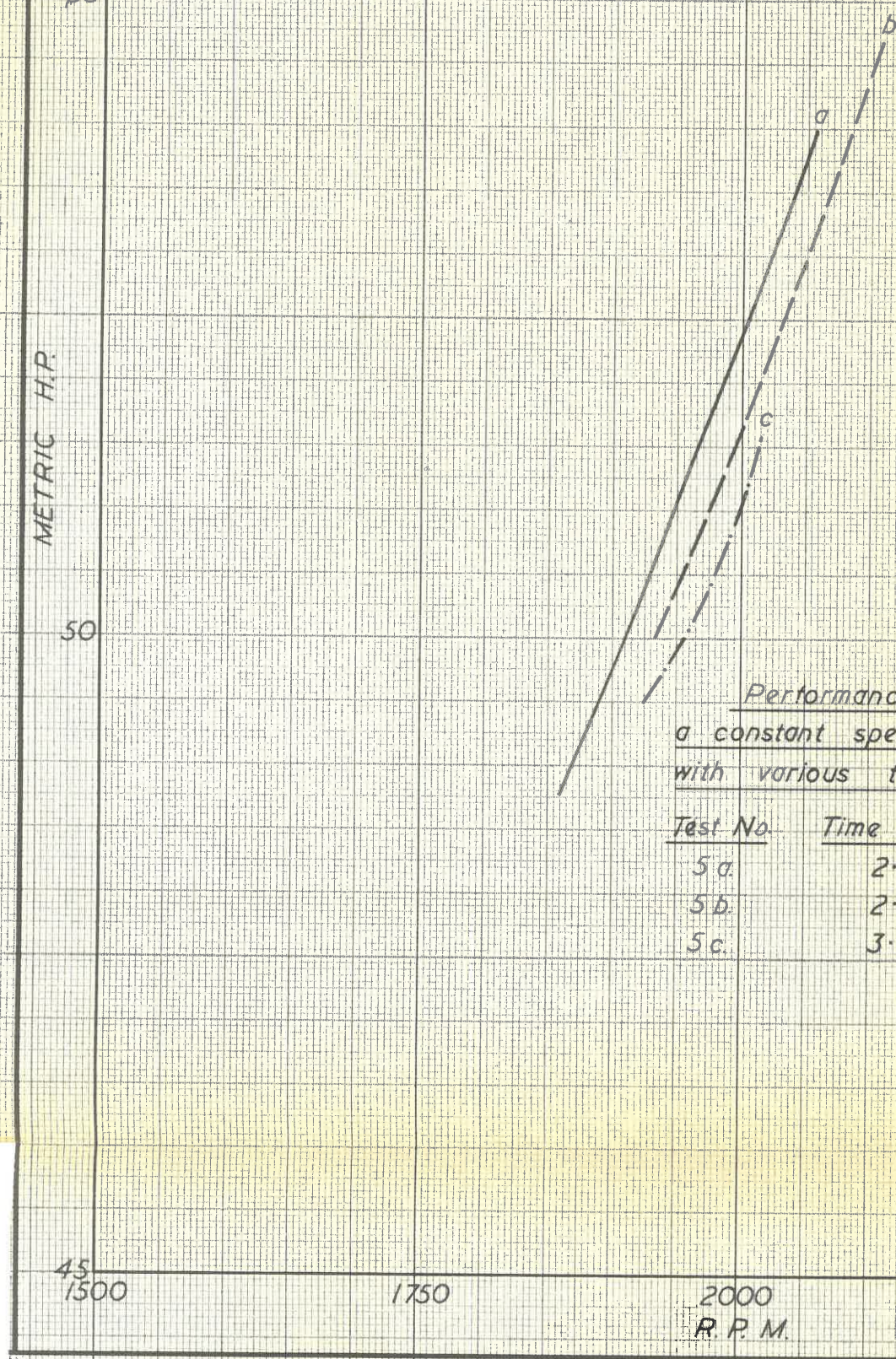
PERFORMANCE OF A CHEVROLET ENGINE ON A PREMIUM GRADE PETROL AFTER 10 CARBON-FLO PELLETS HAD BEEN IMMERSED IN 5 GALLONS OF PETROL FOR 24 HOURS.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
3.25	1022	1.48	1.49	0.113	13.2	17.8	25.3	268	75.0	480	18	28.5
3.28	1424	2.07	2.08	0.162	12.8	18.1	36.0	270	75.3	500	21	28.5
3.30	1970	2.87	2.89	0.224	12.9	18.3	50.3	267	75.5	540	25	28.5
3.33	2516	3.65	3.67	0.262	14.9	17.7	62.1	253	75.2	610	33	28.5
3.38	2989	4.25	4.28	0.320	13.4	15.8	65.9	291	73.7	660	42	28.5

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Orifice Intake Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of test : 13 minutes.

TABLE NO. 10...../

FIG 6.



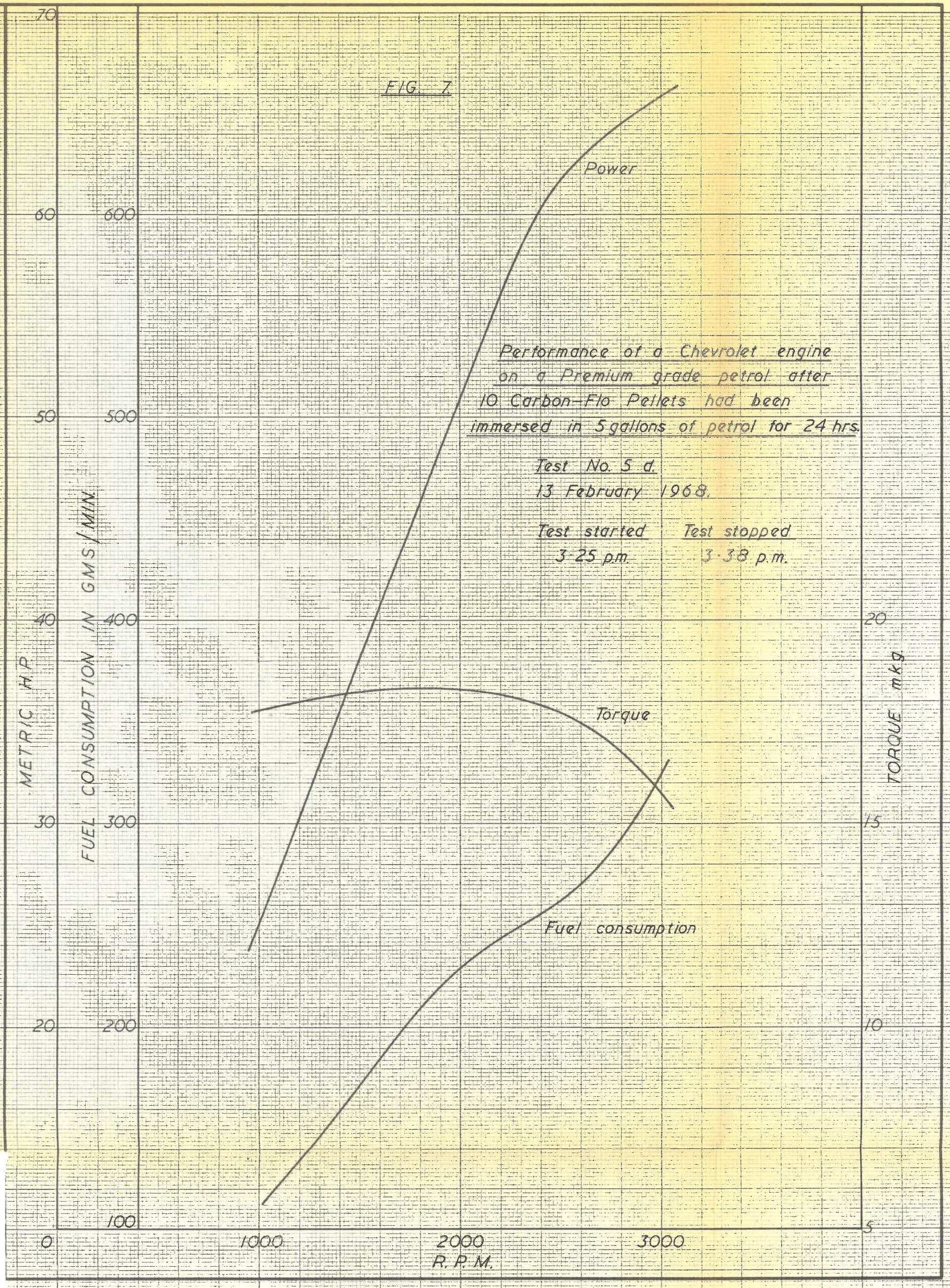
a. Untreated Premium grade petrol.
b. Premium grade petrol with 42 Carbon-Flo pellets in ADCO Filter.
c. Premium grade petrol after 10 Carbon-Flo pellets had been immersed in 5 gallons for 24 hours

Test Nos. 5 a. b. & c.
13 February 1968.

Performance of a Chevrolet engine at a constant speed of approximately 2000 R.P.M. with various treatments of Carbon-Flo pellets

Test No.	Time started	Time stopped
5 a.	2·10 p.m.	2·25 p.m.
5 b.	2·32 p.m.	2·50 p.m.
5 c.	3·05 p.m.	3·20 p.m.

FIG. 7.



Performance of a Chevrolet engine on a Premium grade petrol after 10 Carbon-Flo Pellets had been immersed in 5 gallons of petrol for 24 hrs.

Test No. 5 d.
13 February 1968.

Test started 3-25 p.m.

Test stopped 3-38 p.m.

TABLE NO. 10.

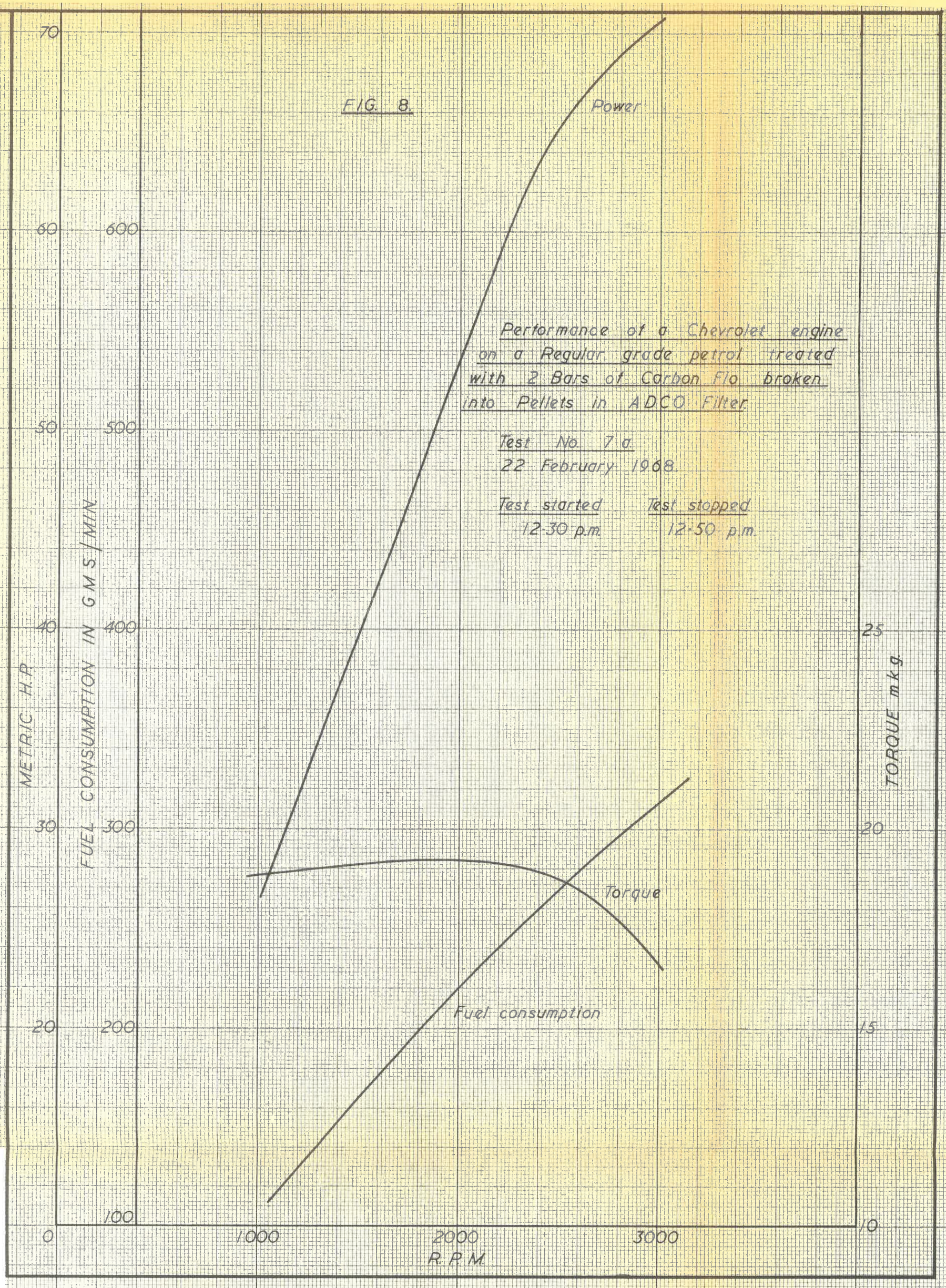
PERFORMANCE OF A CHEVROLET ENGINE ON A REGULAR GRADE PETROL TREATED WITH 2 BARS OF CARBON-FLO PELLETS BROKEN INTO PELLETS IN ADCO FILTER.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
12.30	2958	4.25	4.37	0.307	14.2	17.0	70.1	263	74.4	670	41	25.0
12.35	2443	3.53	3.63	0.261	13.9	18.8	64.1	244	74.9	640	30	25.0
12.40	1895	2.81	2.89	0.209	13.8	19.1	50.5	248	76.8	600	25	25.0
12.45	1475	2.18	2.24	0.161	13.9	19.1	39.3	246	76.6	540	21	25.0
12.50	1069	1.60	1.64	0.116	14.1	18.9	28.2	247	77.6	480	18	25.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 20 minutes

TABLE NO. 11...../

FIG. 8.



Performance of a Chevrolet engine on a Regular grade petrol treated with 2 Bars of Carbon Flo broken into Pellets in ADCO Filter.

Test No. 7 a.
22 February 1968.

Test started 12-30 p.m.
Test stopped 12-50 p.m.

TABLE NO. 11.

PERFORMANCE OF A CHEVROLET ENGINE ON AN UNTREATED REGULAR GRADE PETROL.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
4.10	1080	1.57	1.61	0.124	13.0	18.6	28.0	266	75.3	480	17	26.5
4.13	1389	2.03	2.08	0.154	13.5	18.5	35.8	258	75.7	500	20	26.5
4.18	1929	2.83	2.90	0.214	13.6	18.7	50.3	255	76.0	570	24	27.0
4.23	2411	3.55	3.63	0.267	13.6	18.3	61.5	261	76.3	620	30	27.0
4.26	2905	4.16	4.26	0.307	13.9	16.8	68.1	271	74.2	660	38	27.0
4.30	2915	4.20	4.30	0.308	14.0	16.7	67.9	272	74.6	660	38	27.0
4.35	2512	3.66	3.74	0.272	13.8	18.2	63.8	256	75.5	630	30	27.0
4.40	1937	2.83	2.90	0.211	13.7	18.7	50.5	251	75.7	600	24	27.0
4.42	1399	2.03	2.08	0.155	13.4	18.6	36.3	256	75.2	540	20	28.0
4.44	1105	1.60	1.64	0.125	13.1	18.7	28.8	260	75.0	490	17	28.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 34 minutes

TABLE NO. 12.

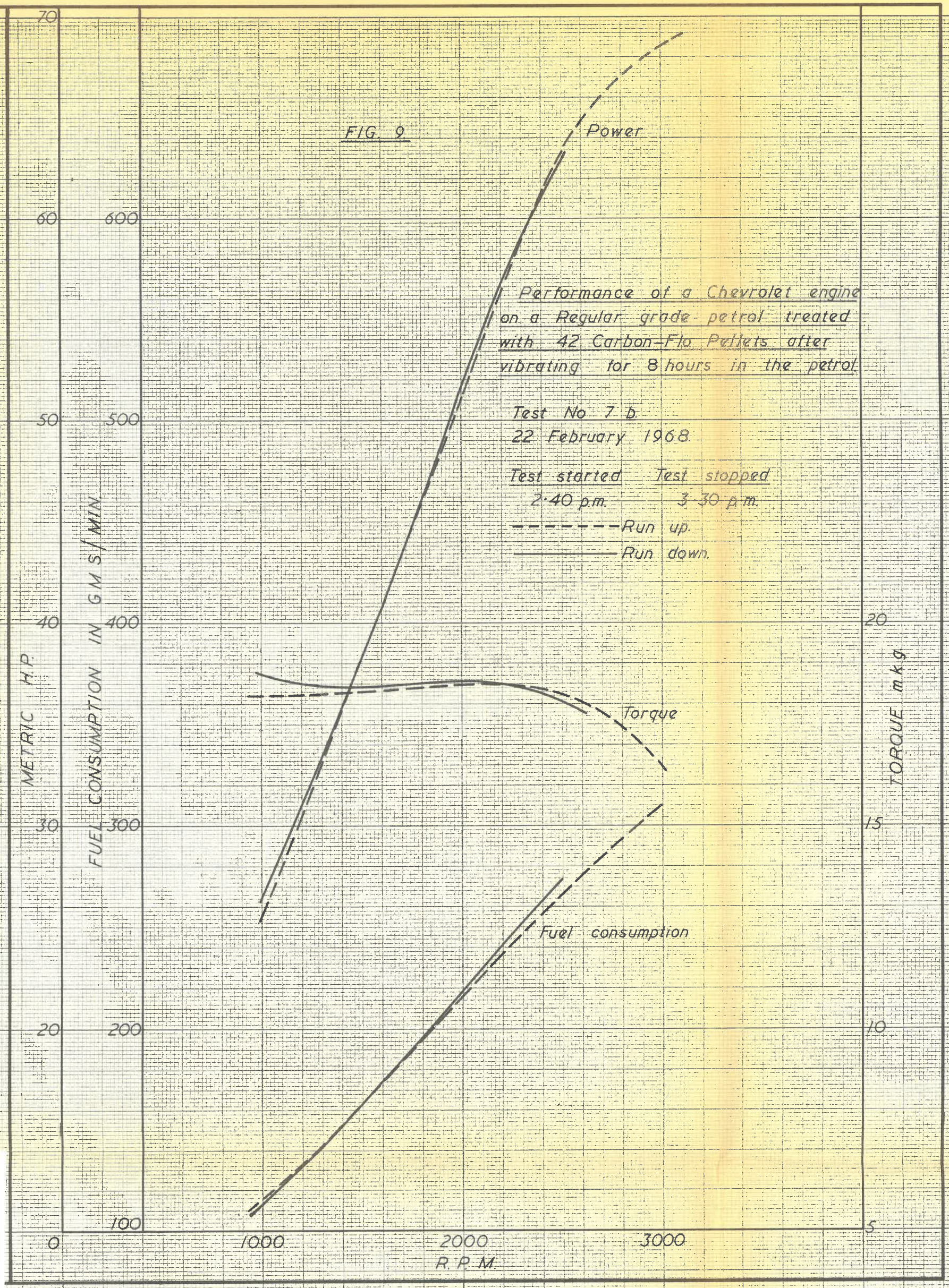
PERFORMANCE OF A CHEVROLET ENGINE ON A REGULAR GRADE PETROL TREATED WITH 42 CARBON-FLO PELLETS AFTER VIBRATING FOR 8 HOURS IN THE PETROL.

Time of Readings p.m.	R.P.M.	Air Rate		Fuel Rate kg/min.	Air Fuel Ratio	Torque mkg	Output metric H.P.	Efficiency		Exhaust Gas Temp. ^{o}C	Ignition Advance Degrees	Fuel Temp. ^{o}C
		m^3/min.	kg/min.					grams/ H.P. hour	Volumetric %			
2.40	1050	1.55	1.59	0.118	13.5	18.2	26.7	265	76.5	480	17	27.0
3.00	1397	2.03	2.08	0.150	13.9	18.3	35.7	252	75.3	520	20	28.0
3.05	1937	2.83	2.90	0.210	13.8	18.4	49.7	254	75.7	560	24	27.5
3.08	2468	3.55	3.63	0.261	13.9	18.3	63.0	249	74.5	620	30	26.0
3.10	2926	4.10	4.19	0.305	13.7	16.8	68.4	268	72.6	660	39	26.0
3.20	2382	3.45	3.53	0.260	13.6	18.3	60.8	257	75.0	630	30	26.0
3.25	1910	2.75	2.81	0.207	13.6	18.6	49.6	250	74.6	600	24	26.0
3.28	1408	2.03	2.08	0.152	13.7	18.4	36.1	253	74.7	540	20	26.0
3.30	1078	1.57	1.57	0.119	13.5	18.6	28.0	255	75.5	480	18	26.0

Carburettor Main Jet Diameter : 1.33 mm. No. 52
Air Intake Orifice Diameter : 75.4 mm.
Compression Ratio : 1 : 7.3
Total time of the test : 50 minutes.

TABLE NO. 13...../

FIG. 9



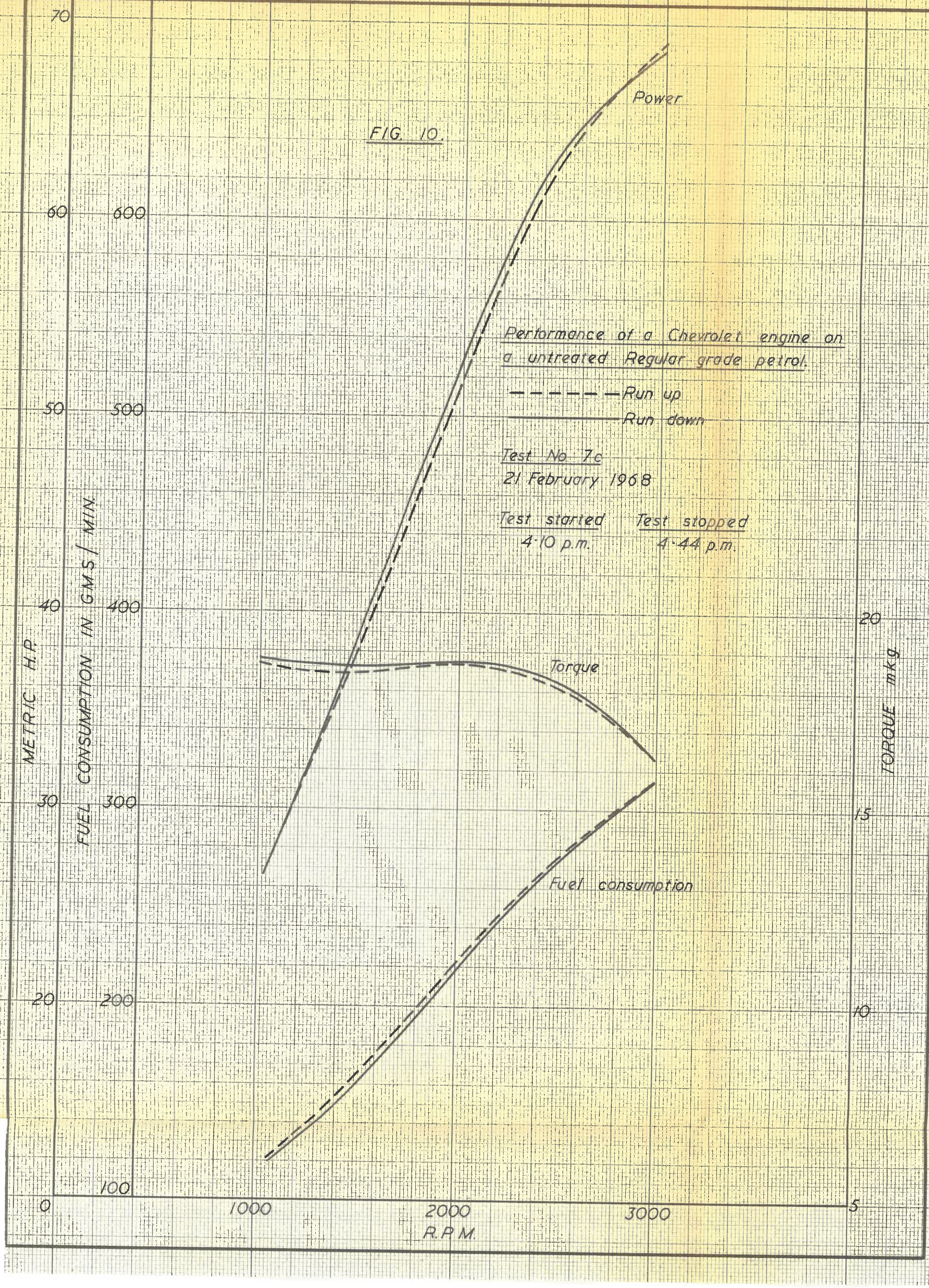
Performance of a Chevrolet engine on a Regular grade petrol treated with 42 Carbon-Flo Pellets after vibrating for 8 hours in the petrol

Test No 7 b
22 February 1968

Test started 2·40 p.m.
Test stopped 3·30 p.m.

– – – – – – – Run up.
——————— Run down.

FIG 10.



Performance of a Chevrolet engine on a untreated Regular grade petrol.

——— Run up

——— Run down

Test No 7c

21 February 1968

Test started 4·10 p.m.

Test stopped 4·44 p.m.

TABLE NO. 13.

EXHAUST GAS ANALYSES.

Test No.	Date	Time Sample Taken	H_2 %	O_2 %	N_2 %	CO %	CO_2 %	Grade of Petrol Used	R.P.M. at time of taking Sample	Treatment of the Petrol
1 repeat	9/2/68	10.48 a.m.	0.7	0.4	85.1	2.8	11.0	Premium	1373	None
		9.50	1.0	0.1	81.1	3.3	14.5		1863	
2	7/2/68	2.23 p.m.	0.7	3.6	82.6	2.7	10.4	Premium	1021	12 Carbon-Flo pellets in Adco filter in fuel line.
		2.30	0.9	0.7	81.0	3.6	13.8		1970	
4(b)	12/2/68	11.00 a.m.	1.0	0.3	82.8	3.2	12.7	Premium	1434	24 Carbon-Flo pellets in Adco filter in fuel line after washing with 10% HNO_3 solution.
		11.05	0.9	1.2	82.3	2.8	12.8		2010	
		11.10	0.9	0.1	81.5	3.4	14.1		2485	
		11.20	1.1	0.4	79.8	3.8	14.9		2958	
4(c)	12/2/68	12.00 midday	0.8	0.5	83.3	2.9	12.5	Premium	1033	42 Carbon-Flo pellets in Adco filter in fuel line.
		12.25 p.m.	1.4	2.1	80.5	4.6	11.4		2933	
6(a)	21/2/68	12.10 p.m.	0.9	1.6	81.4	2.7	13.4	Regular	1970	None
6(b)	21/2/68	2.18 p.m.	0.9	1.4	80.7	3.2	13.8	Regular	1962	2 bars of Carbon-Flo broken into pellets in Adco filter.
7(a)	22/2/68	12.30 p.m.	0.9	0.5	80.2	2.7	15.5	Regular	2958	2 bars of Carbon-Flo broken into pellets in Adco filter.