Beulah. No. Dak.
Jan 18, 1950

School of Engineering
North Dakota Agricultural College
Fargo, North Dakota

Dear Mr. A. W. Anderson

I have your letter of Jan 13 regarding the design of the coal and wood heater of which I have previously asked you whether you would be interested in giving comments on it.

You will find descriptions and illustrations enclosed of this design.

This heater is just like any other ordinary heater. The only difference is that the combustion dome or chamber has fins on the inside and outside. The purpose of these fins is to have more surface exposed to both the heat inside and to the air outside to be heated.

This heater should have a heat deflecting plate in the inside above the feed door so that the heat travels along the walls of the combustio dome. This plate should be mounted on

a shaft protruding on one side of the dome so that the plate can be turned a quarter of a round with the shaker handle to remove soot and ashes which would eventually accumulate on top of the plate.

The dome or drum on this heater would have to be made of cast-iron. The drum could also be made of corrugated steel.

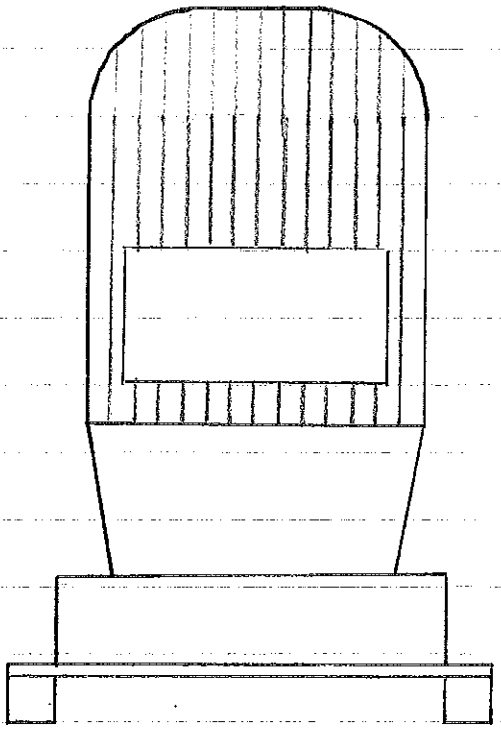
I hope the drawings and descriptions are clear enough to give you a general idea of this design.

Thank You,

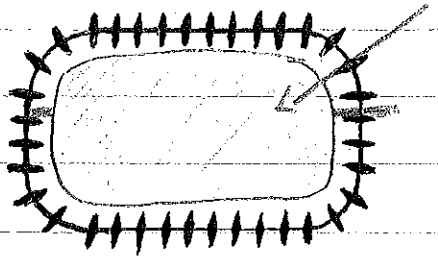
Sincerely Yours

Raymond Eisenbeis

Stanley E. Grant



1. The illustration at the left shows the arrangement of the fins on the combustion dome. Although the door is not shown, it should also have fins to line up with the fins on the dome.



2. The illustration at the lower left is a top sectional view of the combustion dome showing the inner and outer fins.

SCHOOL OF ENGINEERING
NORTH DAKOTA AGRICULTURAL COLLEGE
POST ADDRESS
STATE COLLEGE STATION, FARGO, NORTH DAKOTA

ARCHITECTURE
ARCHITECTURAL ENGINEERING
ADMINISTRATIVE ENGINEERING
CIVIL ENGINEERING
ELECTRICAL ENGINEERING
MECHANICAL ENGINEERING
PHYSICS

January 25, 1950

Mr. Raymond Eisenbeis
Beulah
North Dakota

Dear Mr. Eisenbeis:

Your letter of January 18, 1950 is hereby acknowledged.

I believe your idea for improving furnaces is to increase the surface area both inside and outside the combustion chamber by the addition of ribs or fins. This has, of course, been done before.

The main problem, I believe, in improving furnaces in general is to improve combustion efficiency, that is, improve the actual burning of the fuel so that it will be completely consumed by the fire.

Secondly, the problem is to improve the heat transfer from the burning fuel to the firepot walls. This is now being done by putting in passages in the furnace so that by the time the gases reach the stack all of the fuel has been completely burned.

I believe both of these principles are being employed very satisfactorily in modern furnaces.

I am hereby returning your letter and sketches to you.

Sincerely,

A. W. Anderson

A. W. Anderson
Chairman, Department of
Mechanical Engineering

AWA:b

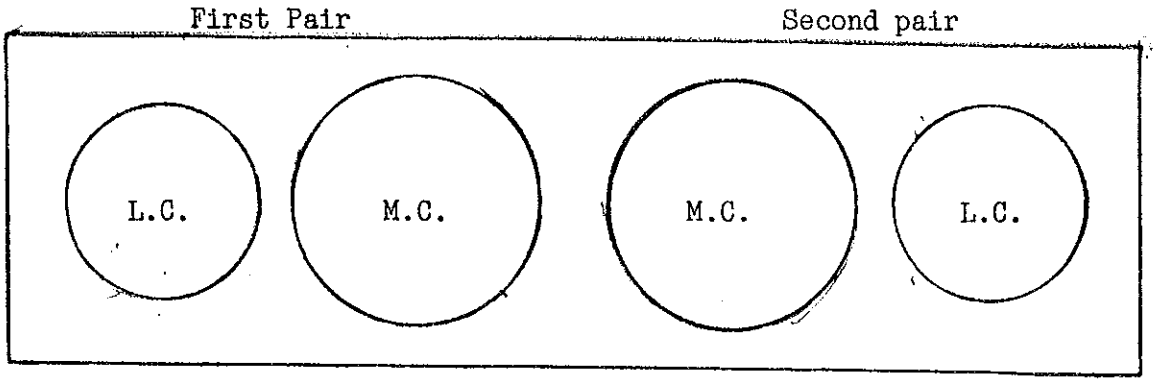
W. R. Olsen

By: Ray Eisenbeis
Feb. 1949

DOUBLE-STROKE ENGINE

L.C. = Leading cylinder

M.C. = Main cylinder



The sketch above shows a top view of the arrangement of a four cylinder internal combustion engine with two main cylinders and two leading cylinders. The leading cylinders work in pairs with the main cylinders. The reason for having a main and a leading cylinder for one power stroke is to make possible the use of a higher compression. The piston in the leading cylinder should be about 30 degrees ahead of the main piston. That is, if a main piston is on upper dead center, its mating or leading piston should be about 30 degrees past upper dead center when combustion should occur if it is on compression stroke. The main cylinder must be larger than its leading cylinder, because when the leading piston commences on its downward stroke, the larger or main piston must still compress the fuel and air mixture until the main piston reaches upper dead center when ignition should occur.

This unit should have overhead valves--two exhaust and one intake valve for each pair of cylinders, or a total of 4 exhaust valves and 2 intake valves.

By: Kay Eisenbeis
Feb. 1949

VALVE TIMING CHART
FOR
DOUBLE STROKE ENGINE

Assuming that the leading piston leads the master piston by 30 degrees. The master piston will be exactly at the top on upper dead center and at the bottom on lower dead center

If intake opens	Master piston is 5 °past U.D.C. Leading piston is 35 °past U.D.C.
If intake closes	Master piston is 10 °past L.D.C. Leading piston is 40 °past L.D.C
During Ignition	Master piston is on U.D.C. Leading piston is 30 °past U.D.C.
If exhaust opens	Master piston is 45° o 50° before L.D.C. Leading piston is 15° or 20° before L.D.C.
If exhaust closes	Master piston is on U.D.C. Leading piston is 30° past U.D.C.

These positions are only approximate and may have to be changed for technical reasons. The bore for the master cylinder should be about 3 3/8 inches and for the leading cylinder about 3 inches. The master or main cylinder should be about 1/8 bigger than the leading cylinder. The strokes should be about 3 3/4 inches long for all pistons. This is only a ratio. The cylinders can be made any size.

JOHN DEERE WATERLOO TRACTOR WORKS
OF DEERE MANUFACTURING CO.

WATERLOO, IOWA

August 19, 1949

Mr. Raymond Eisenbeis
Beulah, North Dakota

Dear Mr. Eisenbeis:

We trust that you will pardon delay in replying to your letters of August 4th and 6th. This is due to the fact that we like to give quite careful consideration to suggestions such as yours on possible engine improvements and, naturally, it takes time to make such analysis and this work has to be fitted in with our regular work. We have studied your proposals for a method of engine construction to allow using low octane fuels with higher compression ratios.

First of all, we would like to modify your conception of the underlying causes of engine knock. In your letter of August 4th you state --"in ordinary gasoline engines the pistons are at the top or on upper dead center when ignition occurs and the pistons are actually at a standstill for a fraction of a second which causes the engines to knock if the compression is too high. However, with the design I am proposing the leading pistons are already moving downwards when ignition occurs which will have a tendency to reduce knocking or detonation; thereby, it should make possible the use of a higher compression."

The foregoing quotation from your letter leads us to the conclusion that you are perhaps a little confused as to the actual circumstances which cause an audible knock in a gasoline engine.

We have had experience of engines using a 4-1/2 to 1 compression ratio which were very prone to knock. When the compression ratio was raised to 5-1/4 to 1 by merely milling a fraction of an inch from the cylinder head, the same engine could not be made to knock. This was due to the fact that the form of the combustion chamber was changed sufficiently to prevent detonation of the last part of the explosive mixture to burn. Engines are being operated at the present time on regular grade gasoline with compression ratios of 14 to 1 and they do not knock.

Knocking is due to improper design of the combustion chamber and not to the fact that ignition of the charge takes place when the piston is at, or near, top dead center.

-Contd-

Your proposed design would improve torque characteristics due to the fact that when ignition occurs, the crank to which the leading piston is connected is at an angle of 30° with the cylinder axis and, - assuming the length of the connecting rod to be four times the crank radius - the length of the lever arm about center of crankshaft would be about 60% of its maximum value instead of zero as would be the case if piston were on top dead center. To achieve this result, however, you have a four cylinder engine of approximately the same length as a conventional four cylinder engine which would give nearly twice the horsepower of the engine made according to your idea.

As regards efficiency, your engine would have more than twice the surface area in the combustion chamber as compared to the conventional engine and would suffer accordingly, due to added loss of heat to the cooling water and by radiation.

It appears, therefore, that while your proposed design has some advantages, the accepted simple design now in general use, in spite of some of its inherent disadvantages, is still the preferred best compromise for production.

We wish to thank you, however, for having called this matter to our attention and remain,

Yours very truly,

JOHN DEERE WATERLOO TRACTOR WORKS
of Deere Manufacturing Co.

B. G. Valentine

BY: B. G. Valentine
Ass't. Chief Engr. in
Charge of Engine Design

BGV:EH

cc: Mr. Rich
Mr. Madill
Mr. Worthington
Mr. C. D. Boylan

GENERAL MOTORS CORPORATION

GENERAL MOTORS BUILDING

3044 WEST GRAND BOULEVARD

DETROIT 2, MICHIGAN

March 7, 1949

Mr. Raymond Eisenbeis
Beulah
North Dakota

Dear Sir:

This will acknowledge your letter of February 22 with drawings and a description of a U-cylinder engine arrangement.

After careful consideration, it was concluded that General Motors is not interested in any patentable details that may be included in the arrangement you have proposed. While we are not permitted to act in any kind of an advisory capacity, I can tell you that we have previously contacted proposals of a similar nature and the Corporation has done some work along these lines.

I regret that we cannot offer you a more favorable reply, but do wish to thank you for the courtesy you have shown in bringing this matter to our attention.

Very truly yours,

Harry C. Dumville
Assistant Director
New Devices Section

HCD:JP:PC

MINNEAPOLIS-MOLINE COMPANY

MINNEAPOLIS 1, MINNESOTA

September 8, 1949

Mr. Raymond Eisenbeis
Beulah, North Dakota

Dear Sir:

We have your letter of September 3 regarding your plans of an internal combustion engine with a higher compression ratio.

We are always glad to take time to talk to people with new ideas. However, we would like to caution you that before coming in to see us you should protect your idea either by having it in writing and notarized or by having applied for a patent.

I wish to say that many of the engines are now being built with a compression ratio far below the ultimate in the design we now have, and the reason that the compression ratios are not higher is that the fuel that is available, and what the customer will buy, will not warrant going into any higher compression ratio.

I suggest if you are in Minneapolis you see the writer or Mr. W. E. Swenson, his assistant. We will, however, be away from the plant all of next week but will return September 19.

Yours very truly,

AUTOMOTIVE DIVISION

/s/ B G Van Zee

Chief Engineer

BGVan Zee/eln