Science & Mechanics

FEBRUARY 35¢

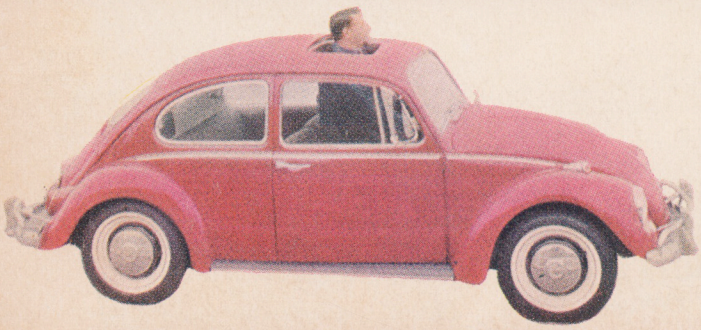
EXCLUSIVE!
MORE UFO SIGHTINGS REVEALED!

AMAZING "ROTATING" ENGINE!

COMPLETELY ENCLOSED!

140 LBS. 400 HP!

ONLY 12 MOVING PARTS!



JOE GUTTS TESTS THE '67 VWs!

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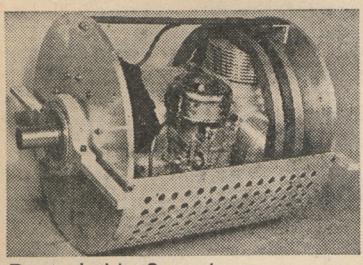
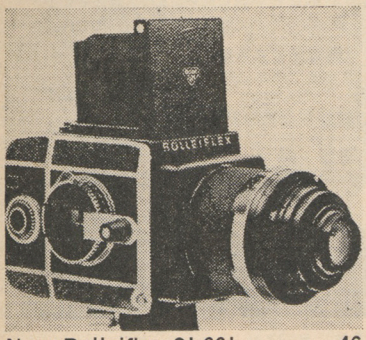
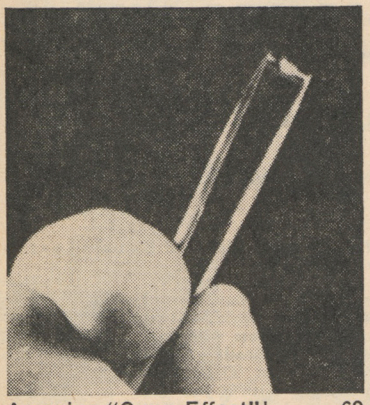


Remarkable Grunstra Engine! 42



New Rolleiflex SL66! 46



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COMING NEXT MONTH:

Want to build a Volkswagen "Fun Bug" for $500? You'll find how in the March S&M! Or how about learning what Joe Gutts thinks of the new Pontiac Firebird? That's in next month's issue too! The March S&M, on sale Jan. 26.

The Remarkable Grunstra Rotating Engine

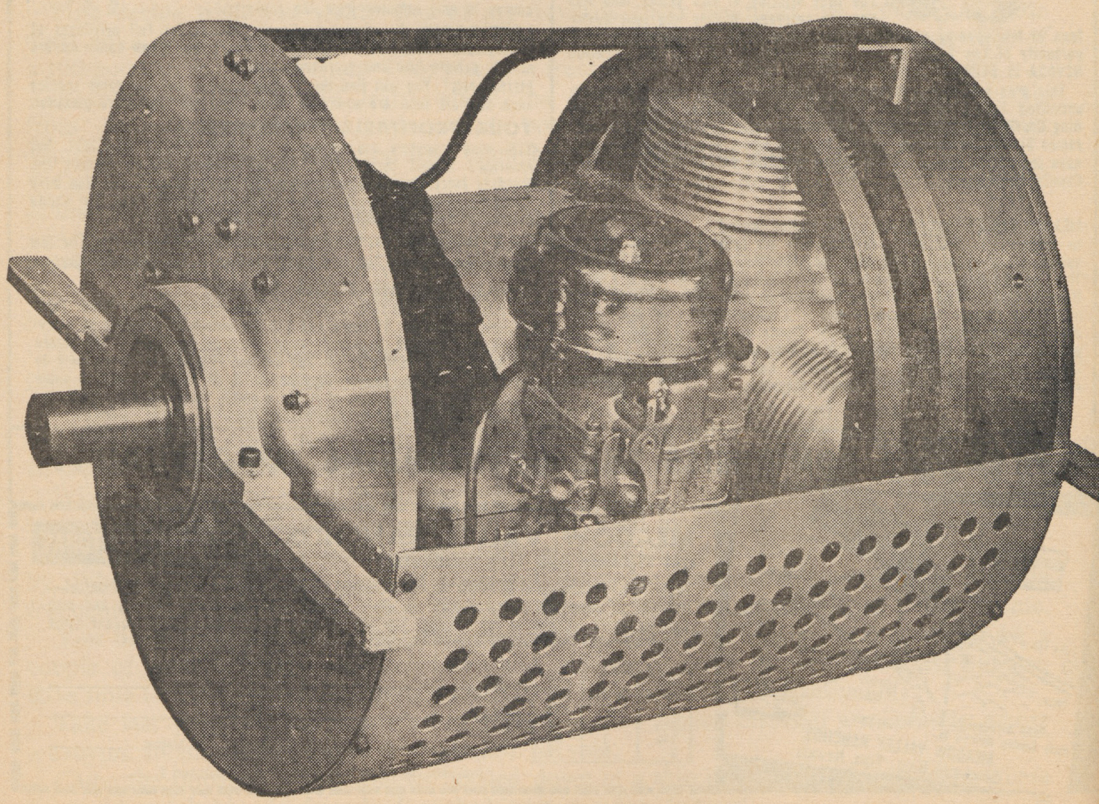
It weighs only 140 lbs., but this power-packed mill produces 400 hp!

By Robert Berger

■ "Engine parts are expensive to produce—and expensive to replace when they wear out," says inventor Peter Combee Grunstra. With that thought in mind, Grunstra sat down at the drawing board five years ago, and began designing an engine with a bare minimum of moving parts—12 to be exact. His plans called for an engine that would have no flywheel, fan, distributor, or sparkplug wiring. Today, after an estimated 2,600 hours of work, the engine has become a reality.

Not surprisingly, it's a rotary design—a choice dictated by Grunstra's insistence on simplicity. By having the cylinders rotate around a stationary crankshaft, it was possible to eliminate many parts normally considered indispensable to a combustion engine. By virtue of its movement, the engine serves as its own flywheel, fan and distributor.

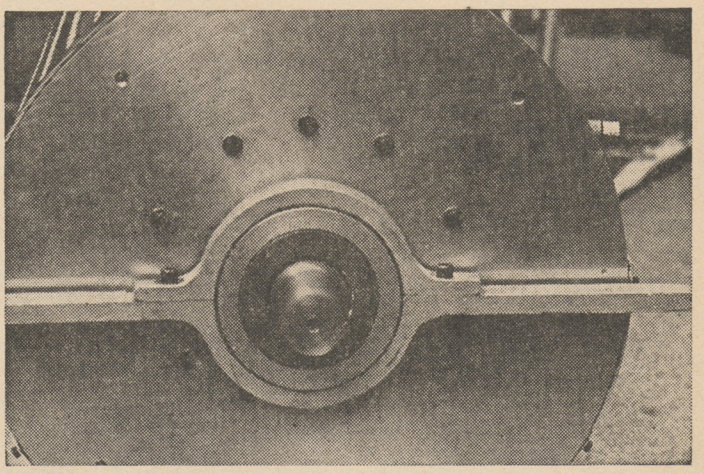
Though it may seem almost



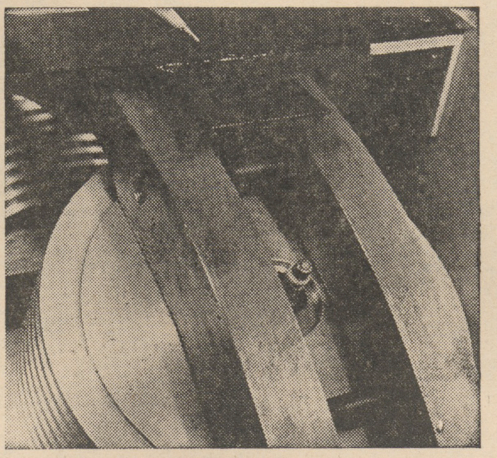
too good to be true, the engine actually combines the best features of conventional two-cycle and four-cycle designs. Like any two-cycle engine, it has a firing stroke on every revolution, has no valves, and is lightweight. Its similarities to a 4-cycle unit are pressure lubrication, smooth idle, and a fuel-air mixture that doesn't enter the crankcase.

By mounting the cylinders on the crankcase at 90-degree intervals, only one crank throw was required. Because the cylinders are arranged so that they oppose themselves, it was possible to employ a unique method of stroking the pistons. Opposed pistons are joined by scotch yokes which are mounted on rollers on the single-throw crank. This eliminates conventional piston pins and connecting rods. But even more advantageous than the savings effected by elimination of parts is reduction of wear. The piston is held in perfect alignment with its cylinder and there is none of the rocking motion characteristic of pistons in standard engines. The design also allows pistons and cylinders to be shortened while retaining the same stroke. The pistons are of skeletal construction and are practically skirtless, except for a small section which covers the intake port. This acts as an intake valve.

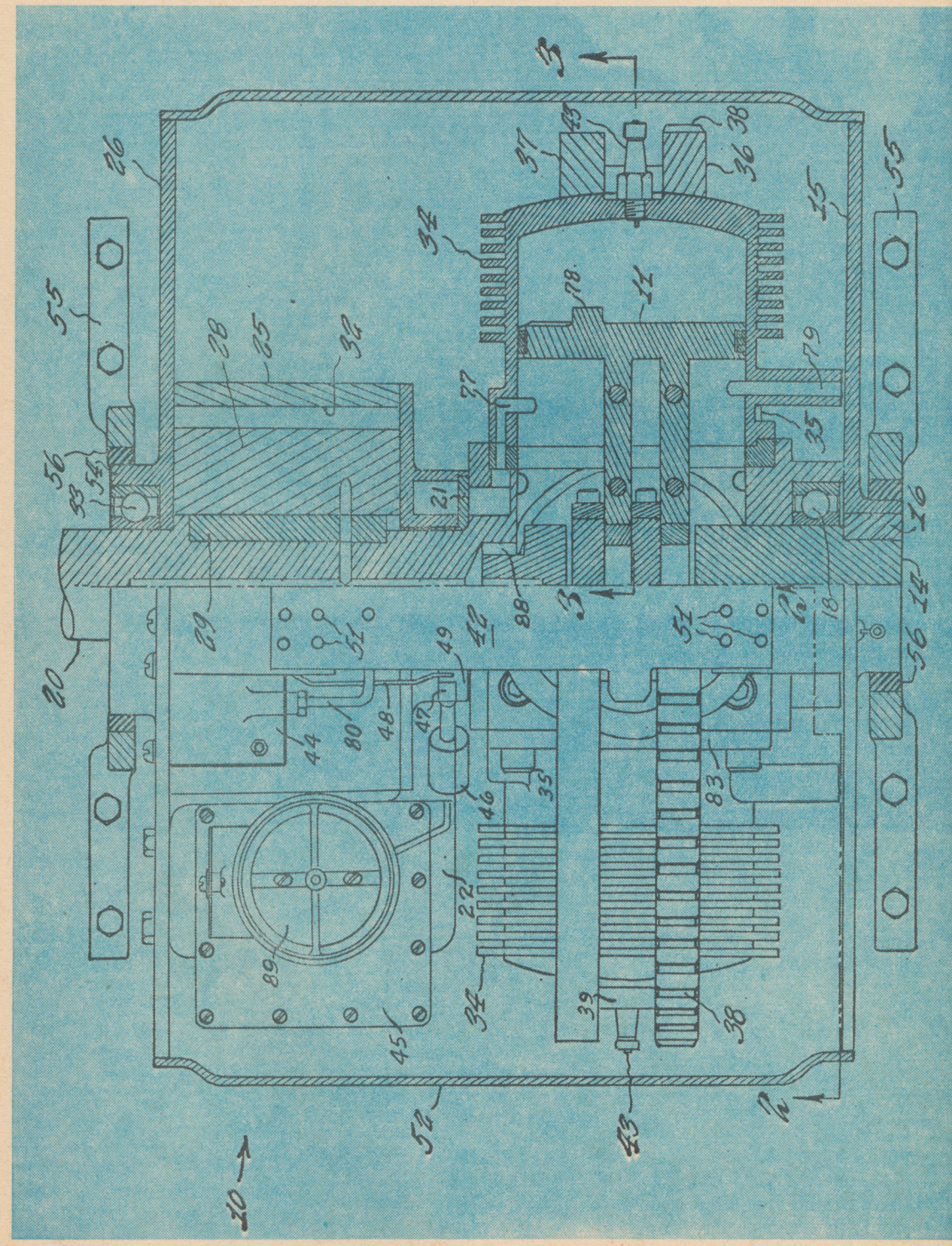
A supercharger is employed to draw the fuel-air mixture from the carburetor, compress it, and force it into the



Cap screws anchoring supercharger housing don't really indicate elliptical shape, explained in story.



Opposite page: Overall view of Grunstra engine, showing the careful machining and workmanship. Inventor estimates he spent 2,600 hours designing and building powerplant. Convention cylinders are used. Ignition to each cylinder is independent; if one cylinder misfires, engine will run on others. Above, conductor is wired to ignition coil. Engine rotation eliminates need for distributor.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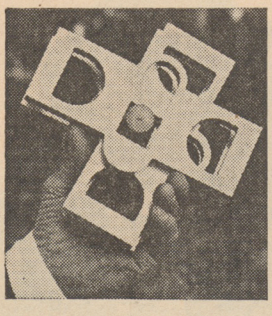
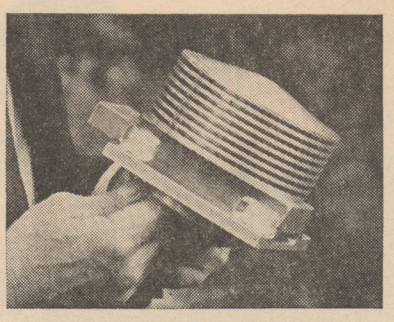
Opposite page: Top half of patent diagram shows cutaway of the cylinder; bottom half shows external view. Important components shown are: 42: conductor; 25: supercharger; 45: carburetor; 34: cylinder; 11: piston. Below left: Wooden model of scotch yokes and crankshaft. Below right: Close-up of the aluminum cylinder used in engine. Bottom: Top diagram shows piston and scotch yoke assembly. Piston skirt is 67. Diagram below is cross-section of supercharger housing.



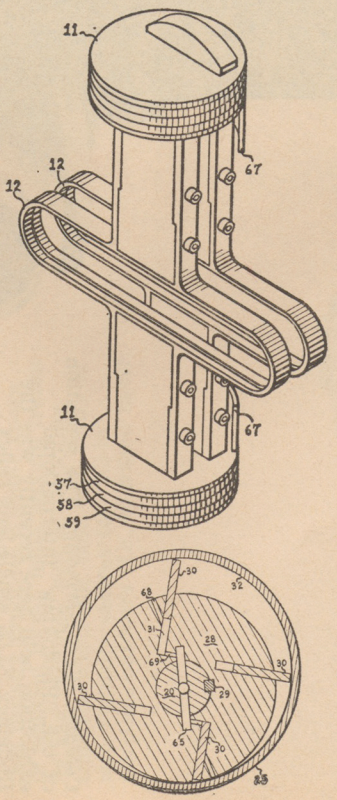


cylinders on their intake stroke. The supercharger rotor is driven directly from the output shaft and requires no separate pulley or gear drive.

The supercharger housing is cleverly designed; its elliptical shape allows the greatest possible arc for each vane to travel. The vanes are spring-loaded and made of Teflon, a material noted for its durability and friction-reducing properties.

Machining the inside of the supercharger housing presented a problem until Grunstra temporarily converted a small bench lathe into a vertical boring machine. In three weeks of spare time work, the inside of the housing was completed.

An outstanding feature of the engine is that it is pressure lubricated, though no oil pump is used. Holes drilled through the supercharger rotor to each vane slot, permit



oil to enter the slot when the vane is in an extended position. As the rotor continues to revolve, the vane slides back into its slot, closing off the holes and trapping the residual oil. The pressure forces the oil into the cross holes, through the output shaft and crankshaft, to the bearings. The supercharger vanes thus perform double-duty; they compress the fuel mixture, and force-lubricate the engine bearings. Oil may be fed from an outside reservoir or mixed with the fuel.

A key part of the design involves ignition of the fuel charge. An electrified bar running along the top of the engine conducts current from the ignition coil to the sparkplugs. As the engine rotates, the top of the sparkplug nearly contacts the bar, the current jumps the gap and the fuel is ignited. Engine rotation assures that the piston will be at the top of its stroke at the instant of ignition. And of course, no distributor is needed because rotation regulates firing of the cylinders. Spark advance is automatic and operates on vacuum derived from the intake side of the supercharger.

The engine doesn't require a fan. The cylinder heads operate at a higher temperature than any other part of the engine. However, they receive the greatest amount of cooling because they move through the longest distance.

The engine is completely enclosed as a safety measure. Its perforated cover rests upon a micro switch which is

(Continued on page 90)

Grunstra Rotating Engine

(Continued from page 45)

wired into the ignition circuit; if the cover is removed, the engine will not run and cannot be started unless the switch is intentionally defeated. The cover also functions as a spacer between the rotating and stationary parts of the engine, and maintains alignment of the support plates. The cover may be easily removed for servicing the engine.

In operation, the fuel mixture is drawn through the carburetor and manifold into the supercharger. It is compressed and forced into the outlet side of the manifold. As engine rotation continues, the piston approaches bottom dead center and begins to uncover the intake port; the fuel mixture is then forced into the cylinder. Further engine rotation starts the piston rising in the cylinder bore. The piston skirt closes the intake port, the piston continues rising and closes the exhaust port. The fuel charge is compressed in the cylinder. When the piston reaches the top of its travel, the fuel is ignited and the piston is forced downward. The force acts on the crank through the scotch yokes and rollers. The cylinder and crankcase rotate, raising the adjacent piston and the sequence continues, with each of the four pistons following the cycle.

The engine's light weight (140 pounds) and high horsepower (it's conservatively rated at 280 hp but with simple modifications could go as high as 400 hp) would make it a likely choice for cars, airplanes, and even portable power plants.

There is remarkably little power loss compared to conventional units because the engine does not have to drive timing gears, cam shaft, valve train, oil pump, distributor, fan or water pump. The elimination of the fan alone means several horsepower saved at high operating speeds. And with no connecting rods or valve train to be concerned about, high revs would not strain the engine.

The Grunstra engine was exhibited at a recent inventors' show in New York City and aroused considerable interest amongst both the viewing public and manufacturers. Currently, Mr. Grunstra is demonstrating his invention to several companies interested in possible licensing and production. At this writing, there are no firm plans for immediate commercial production of the engine, but with its obvious advantages, it seems quite probable that the Grunstra has a happy future awaiting it. ■