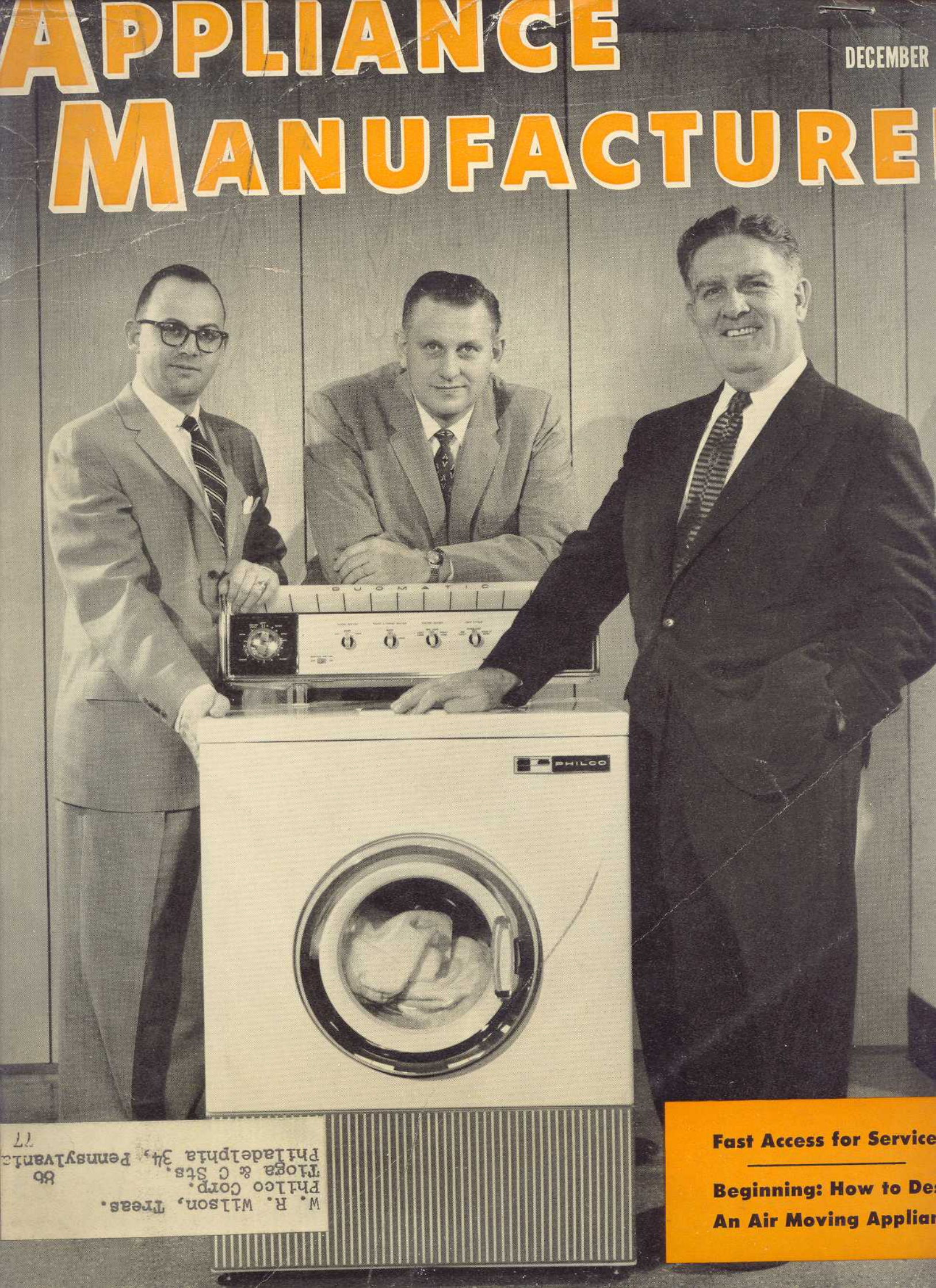
# APPLIANCE MANUFACTURER

DECEMBER

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Fast Access for Service

Beginning: How to De

An Air Moving Applian

VOLUME 6 NUMBER 12

Duomatic washer-dryer system meets the goal of compact under-counter with remote control (above) and free-standing (cover) models.

# A Big Move in Washer-Dryers

## ilco's complete re-engineering and production program produces compact Duomatic priced to sell

OME LAUNDRY manufacturers received quite a surprise when Philco Corporation unveiled the 1959 Duomatic mbination washer-dryers. There were two reasons for the rprise: compactness and price. The big news in the dealer d consumer press, of course, was price.

Laundry Merchandise Manager R. C. Connell, spells out ilco's thinking. "We have a great stake in the Duomatic siness, having purchased the patents from the people who st put a combination washer-dryer on the market. We are alous of our position and we intend to keep it.

"We felt an appliance of the Duomatic type would never sell volume at prices much over $500. We also felt that its size nd weight characteristics required improvement to put it into ass sale. Therefore, we spent several million dollars on com-letely re-engineering and re-tooling with these aims in mind.

"We were able to make production improvements as well s cost reductions. We also firmly expect we will do a greatly increased volume in Duomatics, and our prices are based on volume business much larger than anything now current in the laundry field. Reception of this appliance by distributors and dealers, proven by orders placed, thoroughly justifies our expectations. We know our pricing has had a great deal to do with this.

"In this new pricing, there is no one spot in our program where we can point and say, 'This is what gave us lower pricing.' We can only point to the complete picture, including very smart planning and astute engineering, aimed at producing equally or more effective results, but with lower component and production costs. The whole story would be an item by item examination: a dime saved here, a quarter there. All this adds up to the startling list price we announced.

"Since we are going to make thousands more of these Duomatics, quantity production gives us a saving in plant arrangements, burden absorption, and general overall economy in the

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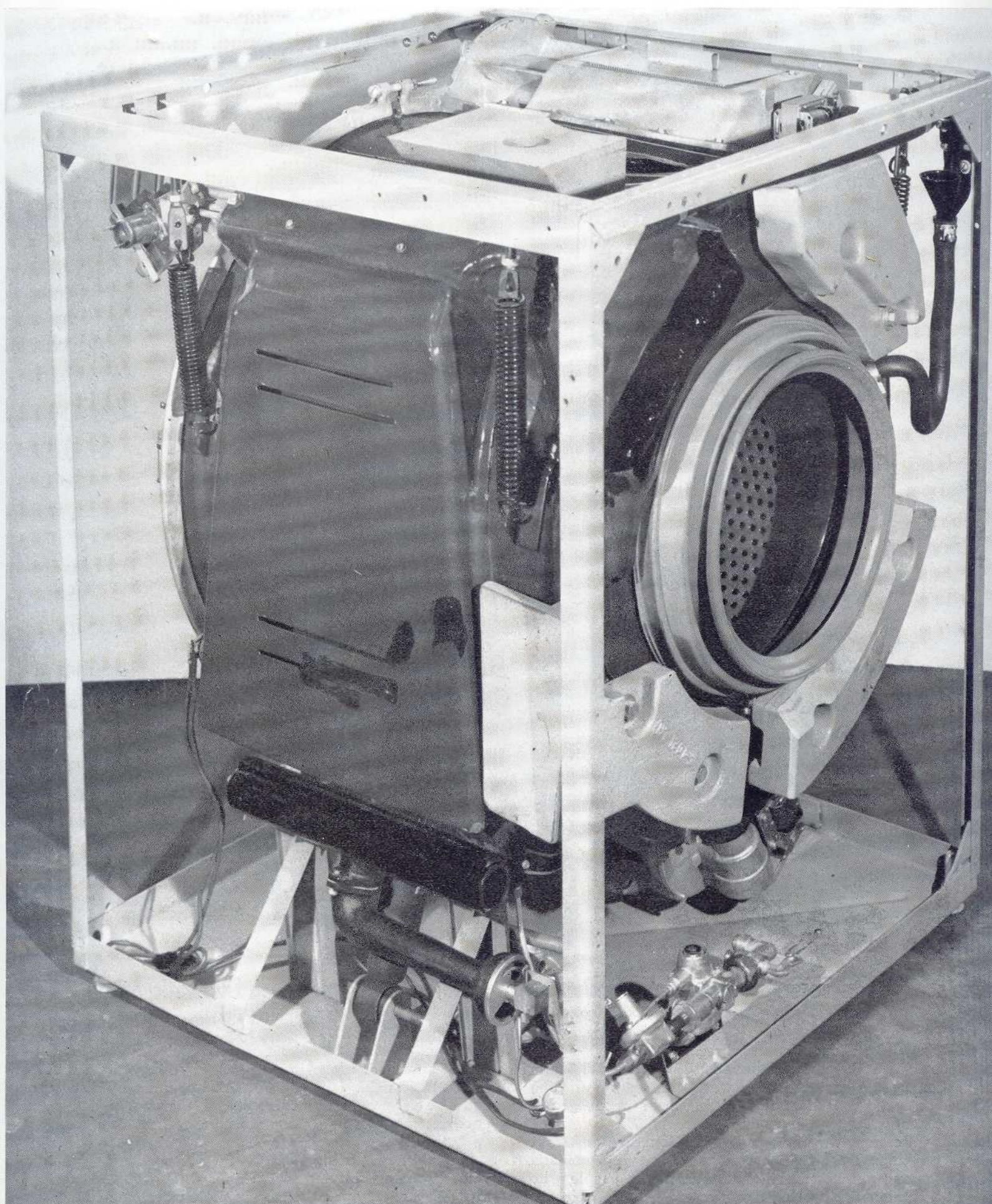


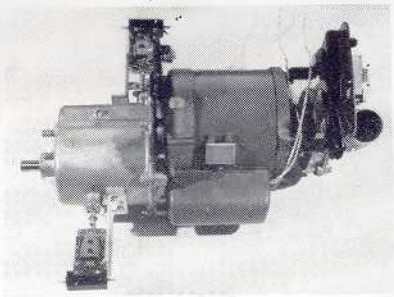
**FRAME** which holds suspended system speeds assembly, permits use of 20 gauge cabinet. It also proved ideal for studies during vibration development. Drying cycle (diagram at right) tumbles clothes in heated air stream that starts with room air coming across burners (B) up to side duct (L) through intake shutter (C) down into perforated tub ring (D) as shown by 2 and 3 and into cylinder, 4 and 5, then to exhaust duct (E) and through lint trap (F) into the blower (G) and exhausted to outside, 6 and 7. During wash cycle, and exhaust ducts are shut to prevent any water leaks. Gas trols (A) are mounted to the base and reach from the front of through access door (H) which also permits access to the protector (I). The control panel (M) is handled as a remote for undercounter models. A vent (K) prevents air pressure up inside the drain tub during the fill, insuring proper water

**Big Move** CONTINUED

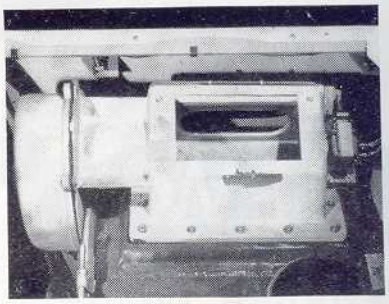
## eely suspended system solves

## mpacting problem and frame construction

## cilitates production and studies



**DUAL CAPACITOR** design adapted to Duomatic's 3-speed transmission ends striking and walking during spin acceleration.



**EXHAUST** duct of molded phenolic houses shutter, solenoid assembly and supports blower. The group mounts as a sub-assembly.

e. In addition, with the increased volume, we could well ord to contemplate a lesser profit picture per unit than can npetitors manufacturing in limited quantities."

Product Development Manager Albert Emanuel II points the 1959 Duomatics are actually the first opportunity Philco gineering has had to "work from the ground up under the ndix patents acquired by Philco." In addition to the stand- design parameters for a washer-dryer, Philco set the fol- ing goals when the program was launched: a free-standing ght of 36 inches and an under-counter height of 34½ inches h a cabinet width not to exceed 27 inches; controls adaptable remote installation; washer water level below the door ket; high spin speed for water extraction; and gas or elec- drying in the same size cabinet.

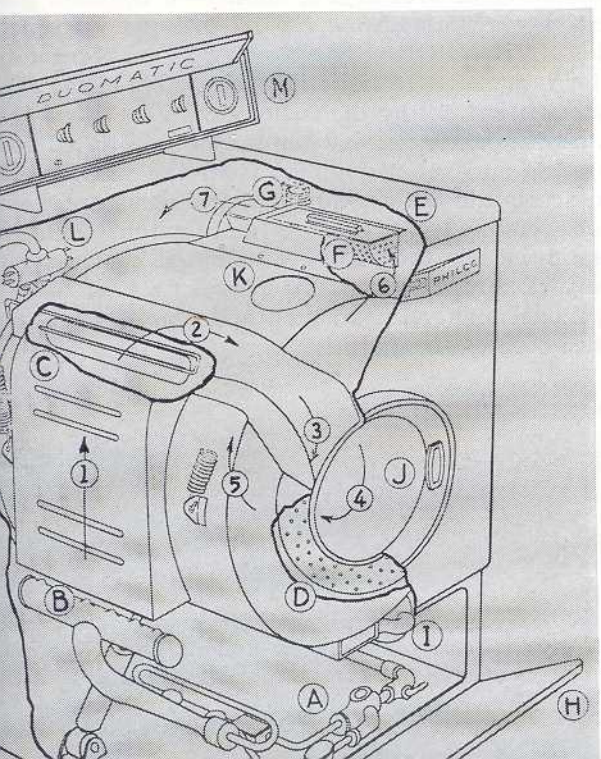
The toughest part of the goal, says Manager of Laundry gineering Edward G. Lipski, was the high speed water ex- ction. This was desirable so (1) drying would be faster l more efficient; (2) rinsing would be more effective; and the Duomatic could be used as a washer or dryer alone. gh water extraction efficiency was obtained by setting spin ed at 560 revolutions. Engineering a freely suspended tem within a 26¾ in. cabinet seemed impossible, he con- ses, until it was found that by limiting the system movement one inch in any direction for any unbalance condition, a in tub could be assembled around the new washer cylinder hin the small cabinet.

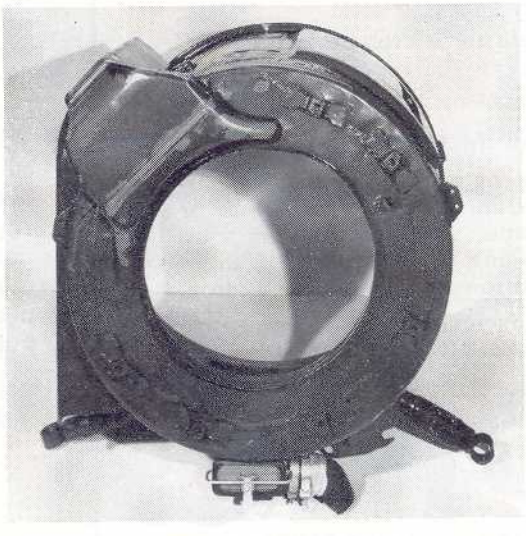
"The four-spring, two-shock-absorber mounted suspension tem with counter weights was successful in the previous ramatic washer and the combination," relates Mr. Lipski, nd most of our experience was in this direction, so it was natural to start there. Months of investigation of each variable, independently and collectively, helped create a new suspension system superior to previous Gyramatics and Duomatics, especially when fixed unbalanced loads were used."

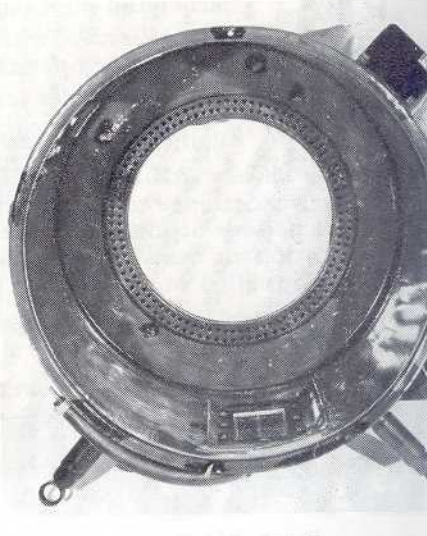
The joy of this accomplishment was short lived, however. Field tests turned up striking and walking of the combination at intermediate speeds of 230 rpm. Investigation showed the condition did not exist when the machine was accelerated from tumble, 57 rpm, to high speed spin, 560 rpm, but occurred only when acceleration was from tumble to the intermediate speed. It proved to be the result of high torque from the motor with the resulting increase in acceleration at low speed, since the motor was, in effect, directly coupled to the washer basket by a transmission and belt system. High speed photographs disclosed the poor clothes distribution with the resultant high unbalance condition at the intermediate speed.

This was corrected by adapting a novel dual capacitor system so that lower torque at the intermediate speed would give slower acceleration and good clothes distribution. The critical frequency of the suspended system was further lowered to well below the 230 rpm intermediate speed.

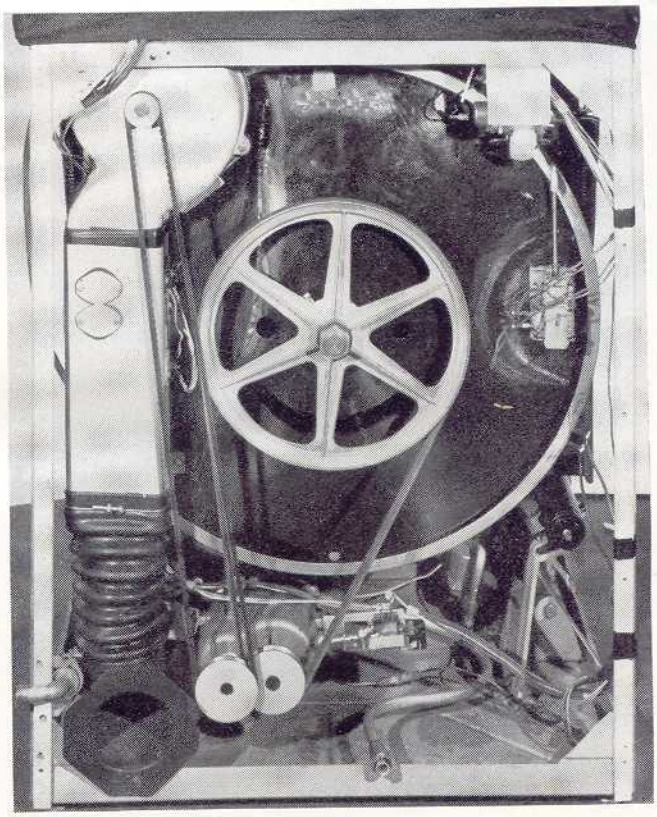
For gas drying, initial tests proved direct entry of hot air into the wash cylinder was most effective, so the air flow problem was limited to designing a compact high capacity blower with minimum obstruction in the air ducts. To find optimum heat input and air movement, the effect of varying one against the other was investigated. A family of curves indicating temperature of the inlet and exhaust air in conjunction with clothes temperature, clearly showed air movement of 100 cfm with clothes in the basket was desirable. CONTINUED





**LARGE SUMP** and powerful centrifugal pump compensate for reduced clearance of new Duomatic between cylinder and drain tub. This minimizes the danger of suds lock. The inlet ring (right photo) of drain tub was perforated to keep clothes out during the washing cycle and yet keep restrictions to a minimum for drying.



**USE OF SUB-ASSEMBLIES,** tested individually before mounting, simplifies assembly and makes servicing in the field easier on the Philco Duomatic washer-dryer.

## System minimizes over-drying possibility

To comply with AGA regulation, 2500 btu per pound o water when drying clothes to 10 percent, it was decided tha 100 cfm and 18,000 btu input would be most satisfactory. This eliminated nuisance trip-outs and permitted setting of the safety thermostat to open when air flow dropped to 55 cfm—a condition possible if the trap was neglected and filled with lint. Clothes temperatures were below 170 degrees F. when checked by the Tempilac test method with AHLMA loads.

It is interesting to note that as water retention in the Philco approaches 5 percent, the drying curve begins to flatten. This is desirable from the customer's viewpoint because it minimizes the possibility of over-drying clothes—a common problem in present day dryers. An error in customer judgment of 10 minutes either way would only result in a 2 percent difference in water retention—a difference discernable in the engineering laboratories, but not by the customer.

Mr. Lipski points out that the use of field tested and proven components and sub-assemblies from the previous Duomatic helped accelerate the development and design programs. This approach, coupled with the use of common tooling from the automatic washer programs, contributed considerably to the economy of the program. The Duomatic task force of engineers, model makers, draftsmen and planners was under the guidance of R. H. Leonard.

**REMOTE** use of control panel for under-counter model is handled easily from basic design. Snap-in connections, protected by sleeves, help speed installation.