

# Noiseless Airplanes Aviation's Goal

Aviation

By DOUGLAS W. CLEPHANE

A few weeks ago an airmail plane roaring through the night received a charge of buckshot dangerously close to its motors. Visions of the first plane hold-up, so often depicted by fiction writers, were dispelled when investigation showed that an irate farmer had used this means of discouraging planes from flying over his land. He said the deafening noise bothered his hens and caused them to stop laying.

He was the first to express his dissatisfaction in such sensational form, but millions of people are becoming intolerant of the noise created by airplanes. Both the airplane riding public and the millions who must hear this noise from the ground are demanding that planes be silenced. Science is attempting to accomplish this, but engineers at work on the problem are finding it one of the most baffling confronting aviation today.

In theory it is as easy to make a noiseless aviation motor as it is to make a quiet motor car, but in practice the problem is far more difficult. Every pound of weight added for mufflers and other silencing devices now on the market reduces the amount of paying mail, freight, and passengers that can be carried. For this reason and because of the added fire hazard and loss of power that most of the devices cause, aircraft manufacturers have been slow to adopt them.

However, even when aviation engineering has advanced to the point where all planes are equipped with quiet motors, the problem is only half solved. At least half of the noise of an airplane comes from the propeller, and there are other minor sources, such as the wind and slipstream from the propeller striking the struts and other exposed surfaces, the rumble and click of gears and valves, and vibration of wires and other parts attached to the fuselage.

Recently there have been two developments that offer the first possibilities of a practical solution of the noise problem. A device which will cut down the exhaust noises without adding appreciably to the weight, fire hazard, or causing a loss of power, has been developed on an entirely new principle than has previously been used.

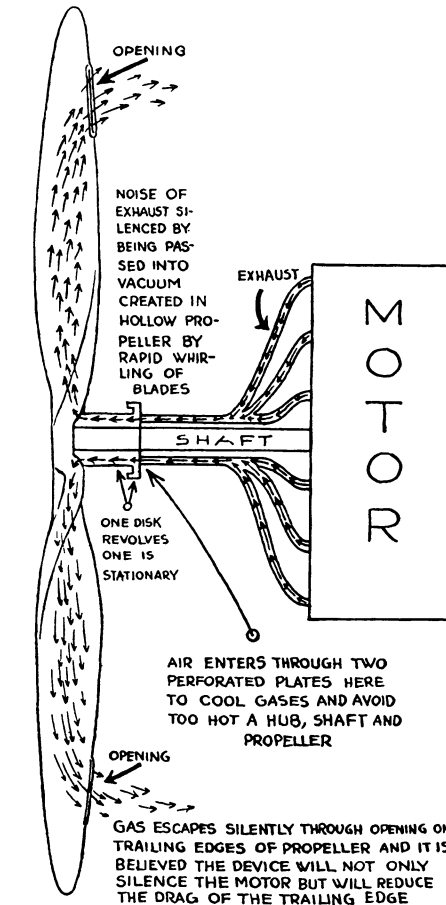


DIAGRAM OF THE HOLLOW PROPELLER, showing how it is proposed to let the engine exhaust escape through the propeller blade, thus reducing the noise of the exhaust and of the propeller itself

The exhaust gases are gathered together in two pipes and passed into the inside of the blades of a hollow steel propeller that has just been invented. By leaving an opening on the trailing edges of the blades from which the gases escape, the centrifugal effect causes a partial vacuum to be built up inside the propeller. Discharging the exhaust into this vacuum, it is believed, will practically eliminate the sound of the motor explosions which form the main source of annoyance both to passengers and persons on the ground. The Navy Department, which is particularly interested in the problem from the military angle, is placing great reliance on this device, and Navy engineers in charge of the work of building a silent plane say that it is the first device that has been presented in 20 years that seems to offer a practical solution to the question of silencing the motor without lessening the efficiency of the airplane.

Tests on the first of these hollow steel blades to be delivered have been so satisfactory that the department plans to order a large number of the propellers, regardless of the outcome of the experiments on the muffling device, as the steel blades will cost less than present aluminum alloy blades. The hot gases will warm the propeller so that there will be no possibility of ice forming on the blades, and no back pressure, which reduces the power of the motor, is built up, as has been the case with all previous devices of this character. This is the first time in 15 years of constant experimentation that a satisfactory hollow propeller has been found. It is made from a light chrome vanadium steel with the elements welded together by a new electrical process, making the joints as strong as the surface. This makes possible the application of the muffling device which is expected to have a marked effect on the future development of aviation.

Not only will the motor be silenced by this device, but it will do away with the long hot exhaust pipe which is the main cause of fire in planes, turning slight accidents in landing and in the air into horrible tragedies. Various manufacturers have cut down the noise to passengers by carrying the end of the exhaust pipe over or under the wings, thus making the wing act as a sound insulator. But the added length of hot pipe furnishes a great fire risk if a few drops of oil or gasoline are spilled in a crash or in refueling.

Several patent applications are now pending on this vacuum method of dealing with the exhaust, and a half-dozen of the leading aviation manufacturers are prepared to spend thousands of dollars to obtain exclusive rights to the invention. It is believed that the fight for the control of this patent will be one of the hardest fought legal battles in the history of aviation.

Even with the motors as quiet as in automobiles, a development which can reasonably be expected within the near future, no means has yet been found to even reduce the roar of the propeller, and the best engineers in this country and abroad can see no solution of the problem. These sounds have two sources: First, the vibration of the propeller itself, and second, the disturbance (Turn to next page)

## Noiseless Airplanes Aviation's Goal—*Continued*

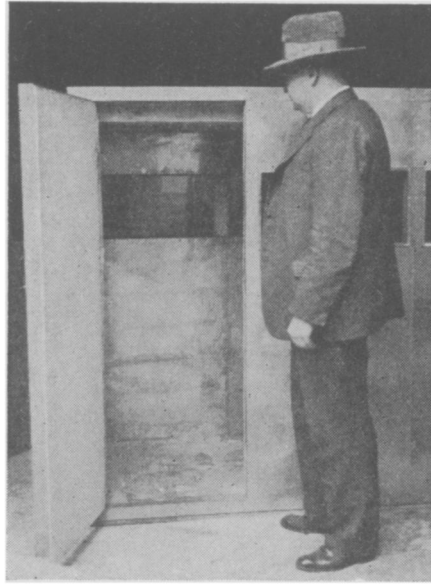
created by the blade tips cutting the air at 6 to 11 miles per minute.

The blades now in general use are made of light aluminum alloy, and they vibrate very much as the tuning fork familiar to every high school student taking physics, thus creating a series of notes much the same as striking several keys at random on a piano.

This noise can be understood by whirling a stick rapidly through the air. A high-pitched and very loud sound is created and when this is multiplied thousands of times the noise made by the airplane propellers is approximated. If the blades can be shortened and the number of revolutions per minute reduced the noise will be lessened, but this so reduces the performance of the plane as to make it impracticable at the present time unless gears and large slowly revolving propellers are used. And this is not always practicable. Some pusher planes are now in use with the motors and propellers behind the cockpit and cabins. This makes the noise less audible to passengers and pilots, but so unbalances the plane that landing is extremely dangerous. Advancement of engineering design may bring this type of plane into more general use. However, all research work along this line indicates that unless the whole principle of plane propulsion is radically changed a certain amount of noise from the propeller will always be present.

The first country to develop a noiseless propeller or other system of propelling the plane will have a tremendous military advantage over the world. The value of airplanes in war depends to a large extent on the element of surprise. At present the noise, which can be heard by sound-detecting devices for miles, gives a warning to the opposing forces allowing them to range anti-aircraft guns, send up opposing planes, and prepare other protective devices that are being developed. If a silent airplane can be invented, entire cities and armies may be wiped out by poison gas, disease germs, and bombs before the ground forces are aware of their presence. A fortune awaits the inventor of such a device for commercial use and military supremacy in the air will go to the country which first develops it secretly.

Engineers granting that this problem is almost impossible of solution, William P. MacCracken, Jr., Assistant Secretary of Commerce in charge



*EXPERIMENTAL NOISELESS CABIN for airplanes, made at the Bureau of Standards, with walls of a new material that deadens sound but adds little weight*

of Aviation, attacked the problem from the angle of building a sound-proof airplane cabin. Funds for the first comprehensive experiments along this line were made available to engineers of the U. S. Bureau of Standards, and they have recently completed the most advanced cabin of this design yet made.

"The success of experiments with this cabin indicate that in the near future all cabin planes will be so constructed that the noise audible to passengers will be reduced from a deafening roar, which makes conversation impossible, to the comparative quiet of a Pullman car," Mr. MacCracken said.

This problem is also difficult because it is not practical to add much weight for sound insulation. The known types of sound proof walls must be rejected for this reason, but engineers of the bureau finally found a new material which deadens the sound without adding much weight. The ideal cabin must do two things, it must deflect as much of the sound from motors, propellers, and vibration as possible, and the inside must be constructed to absorb what sound does enter. The outside of this experimental cabin is composed of duralumin, a light thin metal composed principally of aluminum, and the inside is covered with a material new to airplane construction, made from the fiber obtained from the pods of certain tropical trees. This substance

has been in general use for lining refrigerators, and it is believed will aid greatly in keeping the cabin warm. Each fiber is in effect a sealed air tube, making it very light in weight. The fibers are incapable of absorbing moisture from the air and this is important as disaster might be caused by the adding of unexpected weight to the plane. Sound entering or originating in the cabin is absorbed by the material, which was found to be more efficient than balsa wood, cotton batting, and hair felt which has been used for this purpose by some manufacturers. This type of construction is as satisfactory as any known material five times its weight.

While this construction deadens the sound in cabin planes, it of course has little value when applied to the open cockpit type. The value of the outside duralumin reflecting material is also greatly reduced when the windows are open in warm weather. However, it is quite possible that a new ventilating system may be developed which will allow the air to enter and keep out the sound.

Engineers believe that the development of airplane bodies will follow closely the history of automobiles. In the first stages of their general use, open bodies formed over 95 per cent. of the total sales. Gradually the sedan body became more popular as production costs decreased, until today the great majority of all cars sold are enclosed. The comfort coming from sound insulation possible to passengers only in cabin planes, will probably cause the cabin plane to come into general use within the very near future.

Elimination of other noises such as the vibration of wires, struts, cabin walls, and other engine noises, is merely a question of refinement of design. Great strides have been made in this direction in the last five years, and the final elimination of these minor sounds has almost been accomplished in the more expensive planes.

The whistle of the wind, and slipstream of the propeller against all exposed parts is a more difficult problem. A low velocity wind of 20 to 30 miles an hour creates a very audible sound in blowing through trees, and when this is compared to a wind of from 100 to 125 miles an hour which is the ordinary velocity of wind against the plane, not taking into account the slipstream from the propeller, it is easy to see that (*Turn to page 31*)

# Ur Yields Old Gods and Royal Tombs

Archaeology

The body of a baby girl, adorned with a little gold headdress almost exactly like that worn by Queen Shub-ad of Ur, is one of the new discoveries in the royal graves at Ur of the Chaldees, according to a report just received from C. Leonard Woolley, director of the joint expedition of the University of Pennsylvania Museum and the British Museum.

This 5,000-year-old grave, which Mr. Woolley suggests might be called the grave of the baby princess, contained also a set of miniature silver dishes, including a tumbler and bowls. The royal headdress, which attracted much attention last season when discovered with the remains of the Queen, is a delicate and elaborate structure of gold ribbon, gold leaves, and flowers with pointed petals.

After two months' excavation at the ancient cemetery this season, remarkable finds have already been made, and the investigations have just reached the deep-buried layer of earth where, according to last year's experience, the most important tombs should lie.

The director reports that he is now working at a sector of the cemetery hitherto untouched by archaeologists, and although more than 200 graves have already been found there, only a few places have been probed to the depth at which royal tombs may be expected.

## Noiseless Airplanes—Cont.

a constant whistle will be present. This is being reduced by cutting down the number of exposed wires, supports and other equipment attached to the fuselage.

When early slumbers are broken or the peace of an evening shattered, even aviation enthusiasts have visions of a terrible future when the whole heavens will pulsate to the whirling roar of many motored planes.

Nevertheless, the time is almost at hand when airplane engines will be as quiet as automobile power plants, and airplane passengers can expect to ride in enclosed cabins as quiet and comfortable as railroad cars within a year or two. For the man on the ground, aviation engineering does not promise the complete elimination but only the reduction of the present noise. (Turn to next page)



COPPER STATUE, representing a human face, possibly the face of a god, with animal horns, found in the latest excavations at Ur

From discoveries that have been made, the expedition staff has formed the theory that a king's burial in Ur would be in a subterranean building at the bottom of a deep vertical shaft. After the king was buried there and his slaughtered attendants were laid with him, the shaft would be filled in at intervals with votive offerings up to a certain point. There a chamber would be constructed to receive the last offerings and over this more earth, and finally, possibly as a superstructure, there would be a funereal chapel.

## "Our Father"—65 Per Cent

Education

Tennessee college students preparing to be teachers are well acquainted with the words of the Lord's Prayer, but they understand only about two-thirds of this famous classic which they will repeat daily in their schoolrooms. This is shown by an educational experiment with 540 students, conducted by Lester R. Wheeler, of the East Tennessee State Teachers College, and reported to *School and Society*.

Ninety-six per cent. of the future school teachers wrote the words of the Lord's Prayer from memory without leaving out a word. When asked to explain the fifteen different thought units, the average student gave acceptable interpretations of only 65 per cent. of the ideas. Some of the units were found to be much easier to understand than (Turn to next page)

The tomb of a woman, wearing a golden headdress and other jewelry, has been discovered, the circumstances indicating elaborate burial rites. Four men-servants or soldiers and a serving maid were buried with this lady of Ur. Outside the stone blocking of the door were set clay pots of food and the carcass of a sheep. In the filling-in of the shaft leading down to the tomb, the excavators found tier above tier of food vessels and meat offerings and human skeletons.

"Another most interesting discovery was that of a harp," Mr. Woolley wrote. "The woodwork of the instrument had decayed and disappeared, but luckily a workman noticed the holes which it had left in the soil, and by filling these with plaster of paris we obtained a complete cast of the harp's body, to which was attached the bull's head of copper inlaid with lapis lazuli. The most astonishing thing was the fact that when the earth was carefully cut away to expose the cast there were found surviving as lines of white fibrous powder the ten cat-gut strings of the harp.

"Prominent among our other finds are a copper statue-head, possibly of a god, having a human face and the horns and ears of a bull, and a painted clay pot, which is the first complete one of its kind found at Ur."

Science News-Letter, January 19, 1929

## Good as Neon Lights

Physic

Red neon lights, suggested as beacons for airports, are not any better able to penetrate fog, as its advocates have claimed, than ordinary incandescent lamps, equipped with colored screens. This was announced by Dr. Lyman J. Briggs, of the U. S. Bureau of Standards. Neon lights are familiar to everyone because they are used in the newest tubular advertising signs.

Tests carried out by Bureau of Standards scientists were made under actual field conditions. The neon lamp was compared with incandescent lamps so arranged that the color, size and shape of each lamp appeared identical to the aviator.

"The test showed that there is no real difference in the fog-penetrating quality of the light from the two sources," said Dr. (Turn to next page)

# Misapplied Chemistry

ARTHUR D. LITTLE, in *The Handwriting on the Wall* (Little, Brown):

It would be a pleasure to rehearse the triumphs of applied chemistry and to demonstrate its intimate relation to agriculture and to industry of every sort. I should like to make you realize how deeply you are indebted to Faraday and Pasteur, to Burton, Nobel, and Solvay, and to those many other men of genius who, in cooperation with the rank and file of laboratory workers, have conferred upon you countless benefits. For the moment, however, I have assumed the functions of the Devil's Advocate and in that capacity must direct your attention to chemistry when misapplied.

Misapplied chemistry is the chemistry of the ignorant, the charlatan, and the swindler. It flourished long before the practices of Egyptian priests led the Arabs to adopt for it the name Al Chemy, the Egyptian, or Black Art, and it remains to-day an active and sinister offshoot of the science.

There are, of course, instances without number where chemistry has been misapplied without intention, and these we may view with charity. We may even be grateful to that chemical student who reported that hydrofluoric acid "itches" glass, though it is obviously a pity that glass should itch when it is so hard to scratch. We may sympathize

## Good as Neon—*Cont'd*

Briggs. "In beacons of moderate candlepower any advantages due to the distinctive color of a neon lamp may be obtained more conveniently and simply and more reliably by means of an incandescent filament lamp equipped with a suitable color screen."

As a matter of fact, putting a red filter in front of a light does not increase its fog-penetrating power, he said. Tests were also made with incandescent lamps, one of which was covered with a red screen. The lamps were both of the same power. In every case it was found that the uncovered light could be seen through a greater thickness of fog.

*Science News-Letter, January 19, 1929*

with that other student who defined caustic soda as "a cooling summer drink," and we need not condemn too harshly the druggist who gave the very little girl aspirin when what she asked for was ice cream. The little girl probably said quite enough herself. We need not be so tolerant with the manufacturer who misbrands his goods or who sells water at high prices. Some years ago we analyzed a leather stain for which a Jewish client was paying eighty-five cents a gallon. It proved to be water containing a little gum tragacanth colored with aniline dye. When our client read the certificate he remarked, "Now I see where the Gentiles get the money that we get from the Gentiles."

The late Professor Brush, the distinguished mineralogist of Yale, delighted in the story of the young farmer, who knocked timidly at his office door one day. In response to the professor's invitation to enter, the farmer's head appeared at the partly opened door, and an anxious voice inquired, "Are you alone?" "Yes, yes," said the professor, "come in." The farmer entered, closed the door carefully behind him, seated himself, and from the depths of a carpetbag drew forth a large lump of yellow mineral, which he passed to the professor. "What do you think of that?" he said. Professor Brush examined it for a moment

## "Our Father"—*Cont'd*

others. Only 44 per cent. could explain "Our Father," while Thy kingdom come" proved to be the most difficult of all, and was answered by only 43 per cent. The easiest passages were "and forgive us our debts" and "lead us not into temptation."

The investigation indicates "that the school and church are failing in teaching the student the wider and more subtle meaning of this well-known passage," Mr. Wheeler reports. "If college students understand only about two-thirds of the prayer the ignorance of the average child will probably be more appalling than this study indicates."

*Science News-Letter, January 19, 1929*

and replied, "I never saw a finer specimen of pyrite." "Pyrite!" said the young man, "What do you mean? Ain't that gold?" "No," said Professor Brush. "It is only a compound of iron and sulphur." The farmer sank into his chair, then pulled himself together, and said weekly, "My God! Professor, I've just married twenty acres of it."

Our own experience with the prize hens concerned a local example of misapplied chemistry. The award of the blue ribbon to a fine coop of Rhode Island reds had been contested by a defeated exhibitor on the ground that the hens were dyed. We were waited upon by a committee, who requested that we determine whether the hens were in fact better than they should be, since it appeared that hens are not permitted the cosmetic aids so freely utilized in other feminine circles. Never having analyzed a hen, we stipulated that the committee should supply one which, like Cæsar's wife, was above suspicion. This they did, and from her feathers we were unable to extract a trace of dye. From those of the beribboned birds, however, sufficient color was readily removed to dye deeply large skeins of worsted.

*Science News-Letter, January 19, 1929*

Palestine's Jewish population is growing rapidly.

## Noiseless Airplanes—*Cont.*

With the more vital problems of aviation well on the road to solution, it is quite possible that inventive genius will solve the problem of propeller noise, or possibly change the whole principle of airplane propulsion. It is not beyond the realm of imagination that the present generation may live to see the day when airplanes will slip noiselessly through the air on missions of pleasure and commerce, or in time of war on trips of deadly destruction.

*Science News-Letter, January 19, 1929*

Virginia has produced more scientists than any other state in the South.

*Glance at our back page advertisement of Second Semester Prices of the weekly SCIENCE NEWS-LETTER—we are making some worth while rates to teachers and students.*