"THE AEROPLANE," NOVEMBER 19, 1942.

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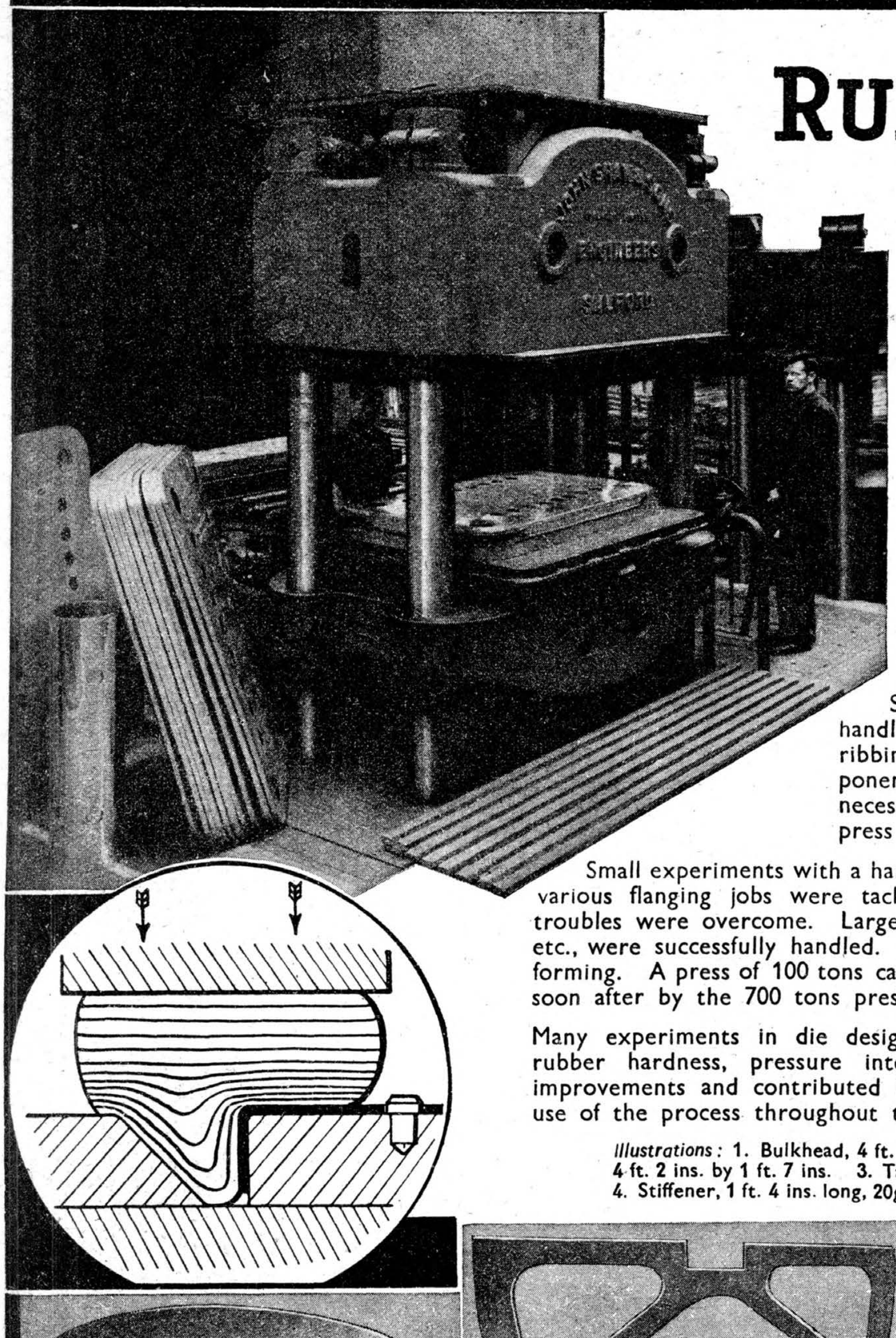
ONE SHILLING

THE AEROPLANE

THE LEADING AVIATION JOURNAL OF THE WORLD

PIONEERING PRODUCTION



RUBBER DIE PRESS WORK

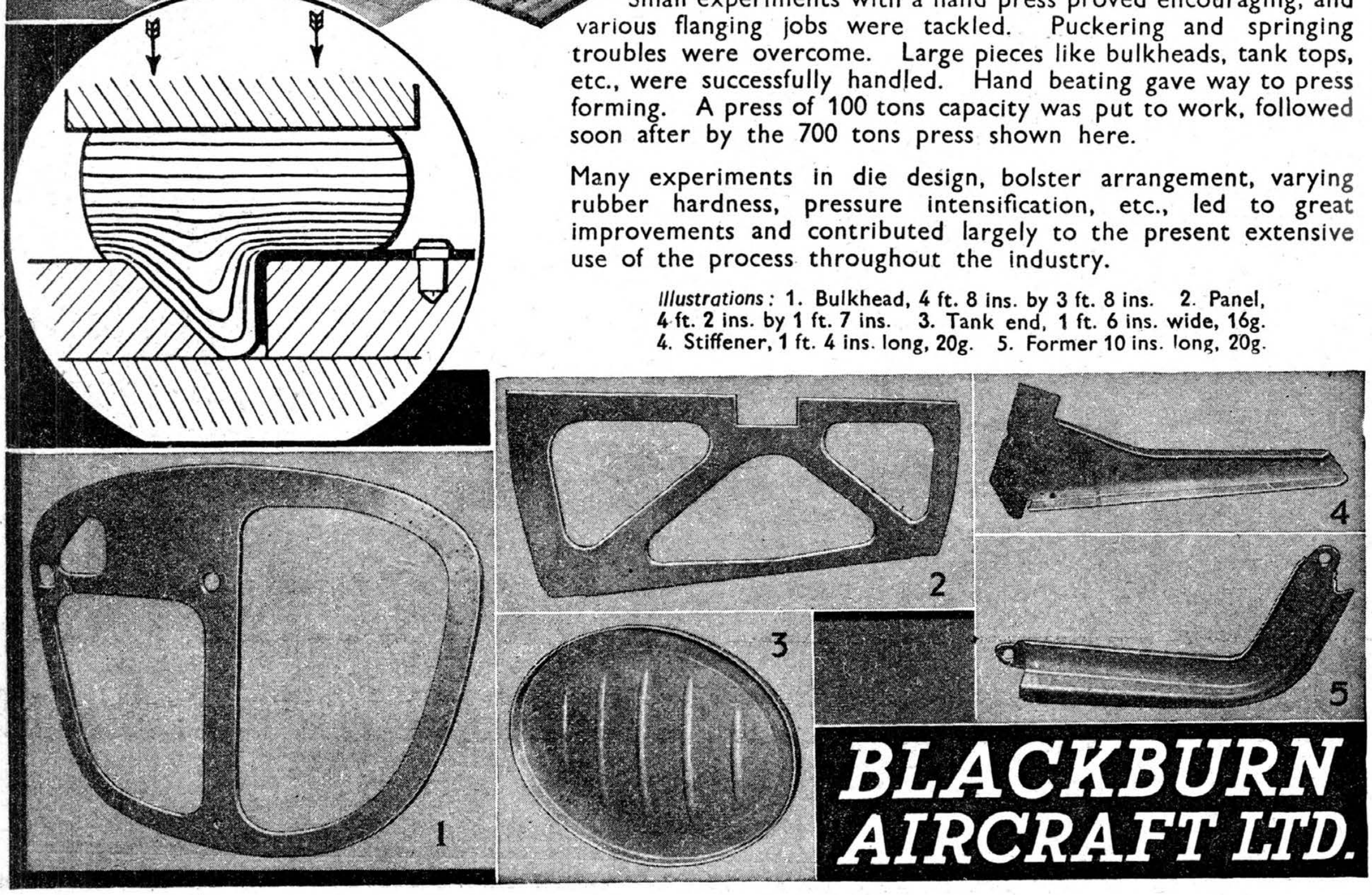
The early development work in the use of rubber in pressing aircraft components in this country was carried out in the Blackburn shops, where much production pioneering has been done. Metal construction had come to stay. Complete sets of metal press tools were out of the question on the score of cost alone.

Simpler means were needed to handle the many flanging, forming and ribbing operations on sheet components. A different principle was necessary. Then the rubber holster press method was devised.

Small experiments with a hand press proved encouraging, and various flanging jobs were tackled. Puckering and springing troubles were overcome. Large pieces like bulkheads, tank tops, etc., were successfully handled. Hand beating gave way to press forming. A press of 100 tons capacity was put to work, followed soon after by the 700 tons press shown here.

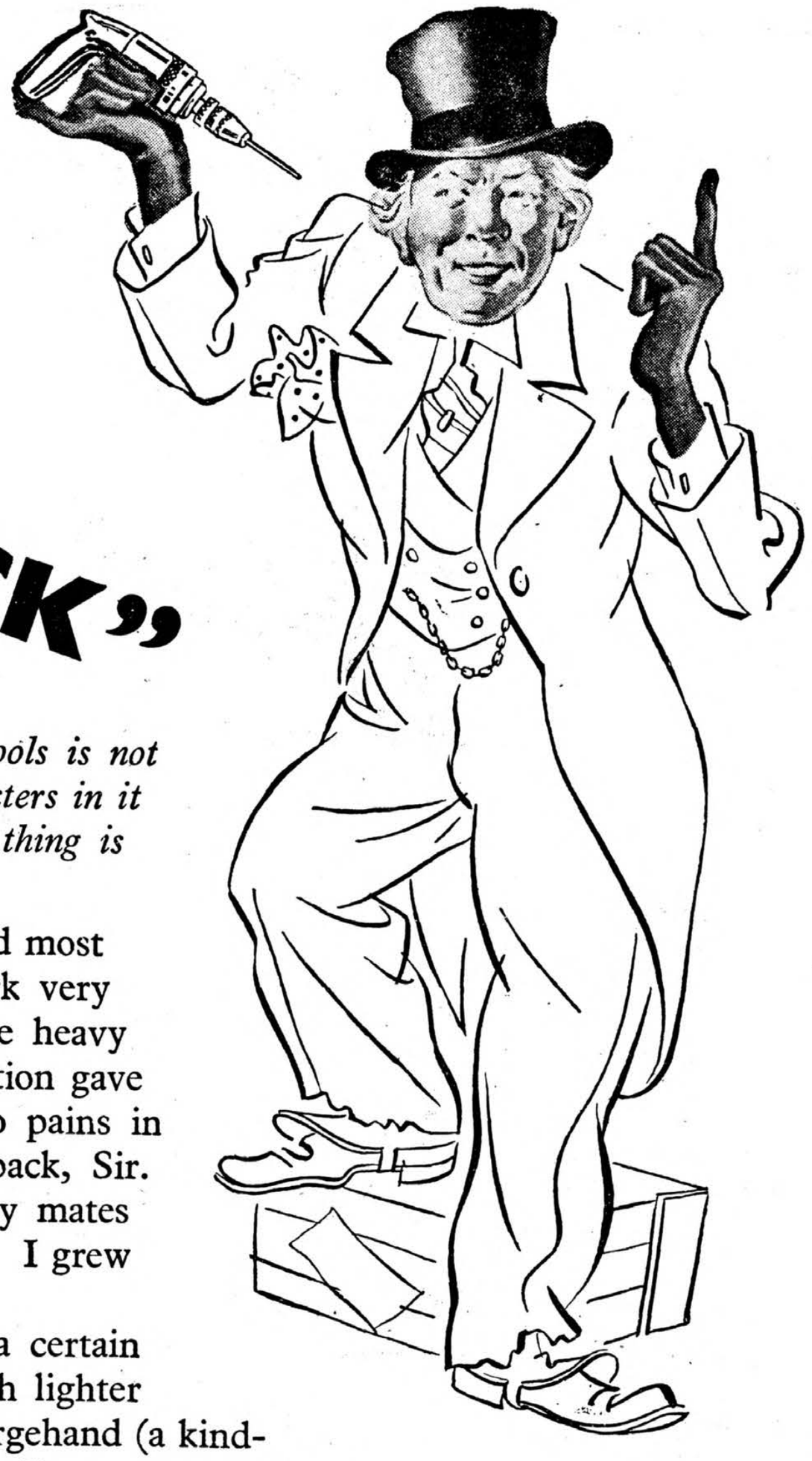
Many experiments in die design, bolster arrangement, varying rubber hardness, pressure intensification, etc., led to great improvements and contributed largely to the present extensive use of the process throughout the industry.

Illustrations: 1. Bulkhead, 4 ft. 8 ins. by 3 ft. 8 ins. 2. Panel, 4 ft. 2 ins. by 1 ft. 7 ins. 3. Tank end, 1 ft. 6 ins. wide, 16g. 4. Stiffener, 1 ft. 4 ins. long, 20g. 5. Former 10 ins. long, 20g.



BLACKBURN AIRCRAFT LTD.

"QUACK"



"QUACK"

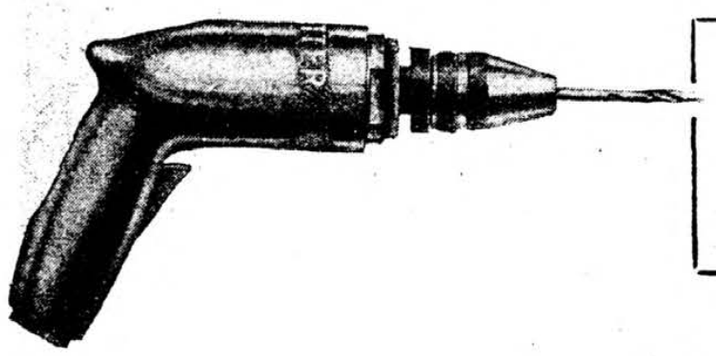
(The following testimonial to Desoutter Tools is not only unsolicited but utterly untrue. The characters in it refer to no living person and indeed the whole thing is a complete invention.)

" Sir, I work in an aeroplane factory and spend most of my day drilling holes. I found my work very boring, Sir. The constant effort of lifting the heavy power drill, Sir, and holding it steady in position gave me pains in my wrists and arms, Sir, and also pains in my shoulders and a pain in the small of my back, Sir. I frequently groaned at my work, Sir, and my mates then said that I gave them a pain in the neck. I grew very depressed and so did my chargehand.

At last one day a friend advised me to try a certain Drill that he knew, Sir. He said it was much lighter and easier to handle. So I persuaded my chargehand (a kind-hearted man, Sir) to get me one of them Dusuetter, Dosooter, Dusouetir — to get me one of your drills, Sir, and Oh! Sir, what a difference. All my aches and pains have gone. I now do twice the work in half the time and instead of groaning I sing. My workmates now complain that I give them a pain in the ear.

Yours gratefully,

I. B. A. Newman (Mr.)"



R.2/45. ¼" Rotor Drill. Chuck speed 4,500 r.p.m. Similar models and speeds of 13,000, 2,100, 1,500, 1,000 or 750 r.p.m. are available. Straight case supplied instead of pistol grip if desired.

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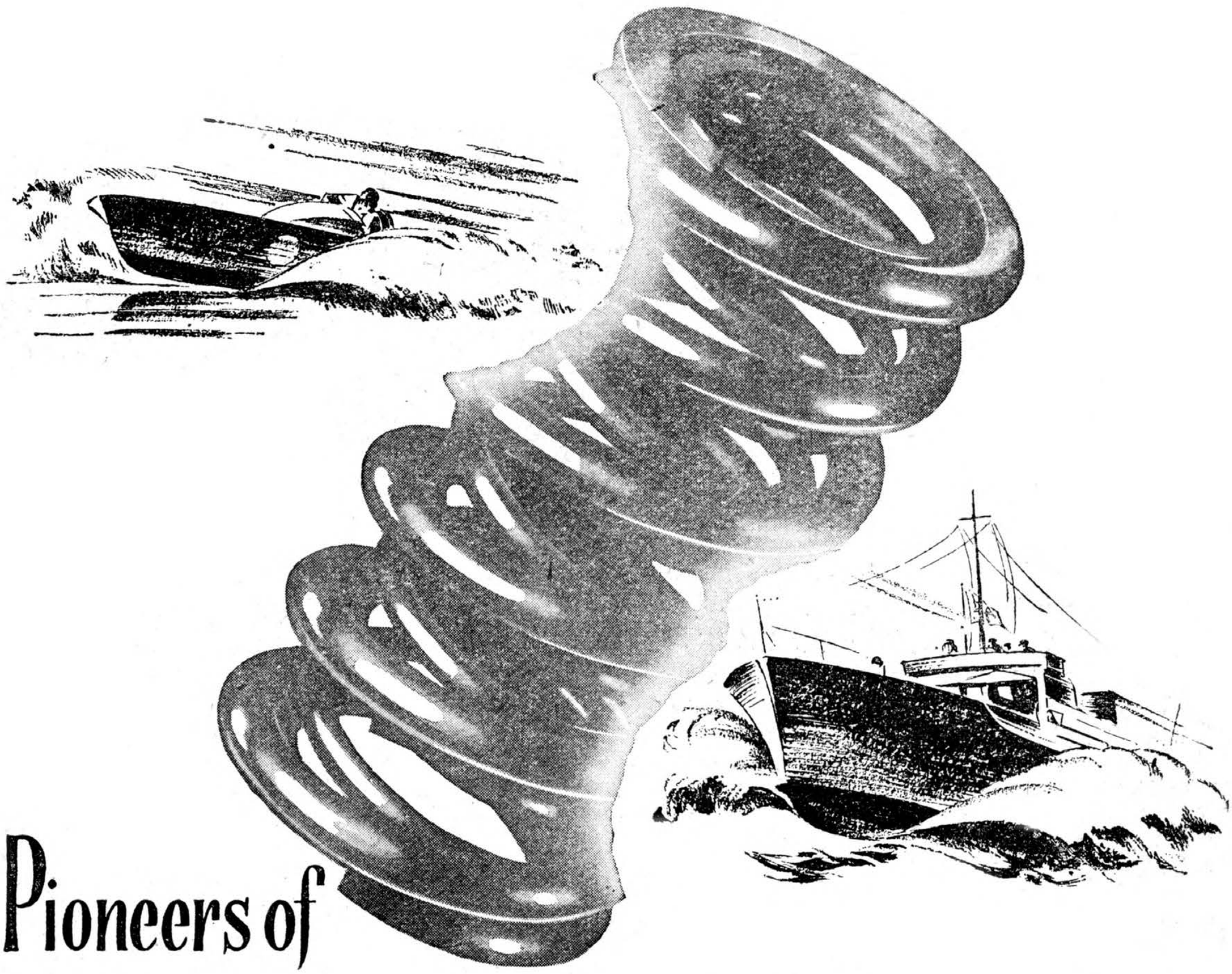

Pioneers of *Speed and Power!*

The designers at the drawing board and the pioneers at the wheel, who sent their boats roaring over lake and lido, in quest of ever higher speeds, have achieved much more than the winning of trophies. They have helped to make British engines and British craft second to none. Many famous engineering firms have contributed to these triumphs. We, at Terrys, produce the Springs upon which the engine efficiency depends .... Springs for engines, Springs for the machines which make the engines, Springs for *all* purposes. Our specialised experience, extending over 87 years, is ever at the disposal of those who are confronted with any problem involving Springs, and Springing devices.

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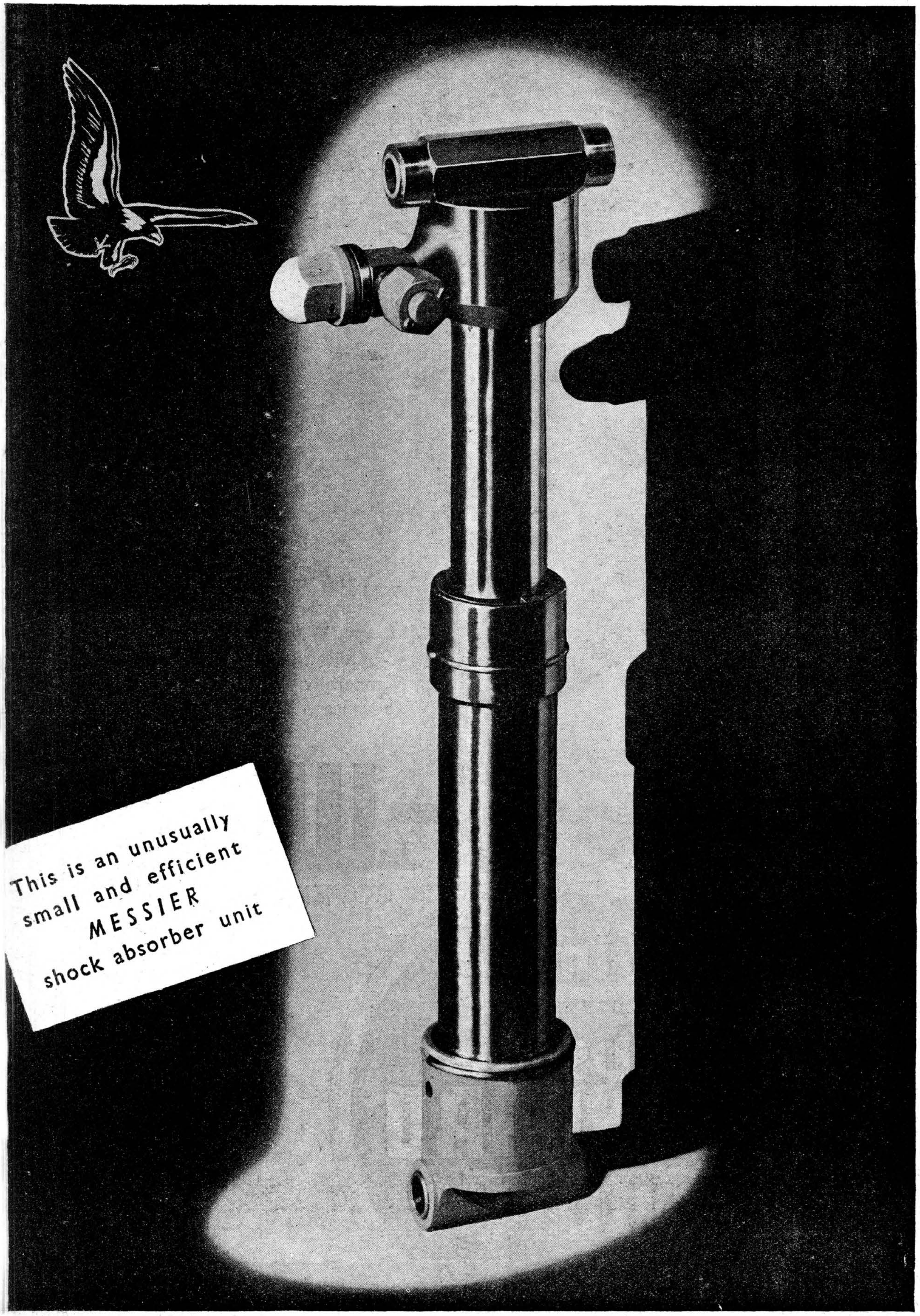
HERBERT TERRY & SONS, LTD., REDDITCH, ENGLAND.


This is an unusually
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MESSIER
shock absorber unit

It came out of the system; when will you put it back?

You may not even know or notice that you've kept a lorry or wagon at your loading bay longer than necessary. But think of the huge daily *total* of wasted time throughout the country. Think of the huge daily total of vehicle-hours lost to the nation.

You can stop one of the thousand leakages of vital journey-time by cutting out 10 minutes in each hour of standstill time.

Set about the job now, please.

You know your own problems best. Tackle them in your own way But tackle them now. Plan, encourage ideas, improvise if needs be.

Here's a starting-off agenda :

1. CHECKING OFFICE ARRANGEMENTS
2. LABOUR SAVING EQUIPMENT
3. BLACK-OUT WORKING
4. OPINIONS OF "MEN WHO DO THE WORK"

WE MUST GET AN EVEN QUICKER TURNROUND

Ministry of War Transport

FAIREY AIRCRAFT

VOL. LXIII. No. 1642

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MATTERS OF MOMENT

African Omens

CURRENTS BEGIN TO FLOW again in and around the Mediterranean. The dam which held them back has been pierced and then blown up. Floods have been loosed. Their pressure affects more than the enemy army which has been swamped and submerged under the westward onrush of forces released by the demolition. It fills the shallows and creeks far beyond them. It creates a tide in the wider waters of the tideless Mediterranean. Its impetus is communicated in ominous, swelling ripples on the farther shores of the "Middle Sea."

Weight and confidence were behind the stroke which partially uprooted the Axis divisions during those 12 days of "in-fighting." Methodical destruction of the barrier was the only course open to the Allied arms in Egypt. The work of reducing the fortified system—the hard crust, the breastplate or shield of the enemy—was done with magnificent thoroughness and persistence. With its ingenious tactical twists, it kept the cost lower than might have been; and it sealed the fate of an enemy force of 10 divisions. Twenty-four times as many enemy divisions still remained elsewhere. What of the strategical effect of the victory on them?

Part of the answer lies in the events which that victory unloosed. The rout of the Afrika Korps bears some resemblance to the breaking of the defensive stalemate by the Germans in Western Europe in 1940. It has changed static war into war of movement. The sweep of war in Egypt drew in the answering movement of the United States and British forces in the Western Mediterranean. It may evoke responses no less dynamic from the enemy. Tides cannot flow in that sea without sweeping some things away. The enemy, if he cannot hold them back, would prefer to control them and direct them away from his interests.

Threats from a Southern Shore

Only the credulous will see in the operations of the American landing parties a purely defensive strategy. The enemy interprets them as part of an offensive design. He takes them to be part of a plan to control not only the whole Southern shore of the Mediterranean, but the whole of the sea itself. He foresees the exposure of his soft belly to the stabs and thrusts of his adversary. The most optimistic strategist on the enemy side would hardly expect the Allies to sit defensively on their Southern shore with 2,000 miles of Northern coastline open to their offensive enterprises. However unimpressed the Russians may have been by the importance of controlling the seas, there has never been any illusion among the Germans about its relation to military successes.

By losing his foothold in Africa, the enemy has failed in his strategy of controlling the Mediterranean through land operations. The logical deduction is that he is faced now with a threat to his land conquests through the passing of control to forces which can bring both Air Power and Sea Power into the balance. He chose to dominate the sea by cutting it where it narrows in the middle. He finds now that his enemies hold that pass and are possessed of sufficient air and sea strength to put their forces through it or across it. They may choose to strike at him at the nearest point or they may bring their legions through to the East and assail him at some point nearer to Russia.

Speed Through the Shorter Haul

A large element of uncertainty has been introduced into Mediterranean affairs. Mr. Roosevelt's reference, in his message to the French people, to preparing the way for the second front, could have been taken by the Axis as proof that Africa is to be made a stepping stone and the Mediterranean a channel for positive blows against the lands held by the enemy. All the World knows that the Allied Nations are ready and eager to extend their offensive sphere in Europe. Their strength has been mounting and is backed now by massive and still growing productive power. Hitherto it could be applied only at long range. By success in Africa the line of communications is shortened by two-thirds of its length.

Armed strength, because of that change, can be massed at the appropriate base three times as quickly and, if the shipping is available, in more than three times the quantity. The Axis could not stop the delivery of men and materials on the long run. It could only cut the traffic on the shorter run while it held bases on both sides of the narrow neck in the Central Mediterranean. It will still attempt to stem the flow from bases on the Northern shore, but it will have to face formidable fighter opposition. The aerodromes at Malta are supported now by other aerodromes within fighter range.

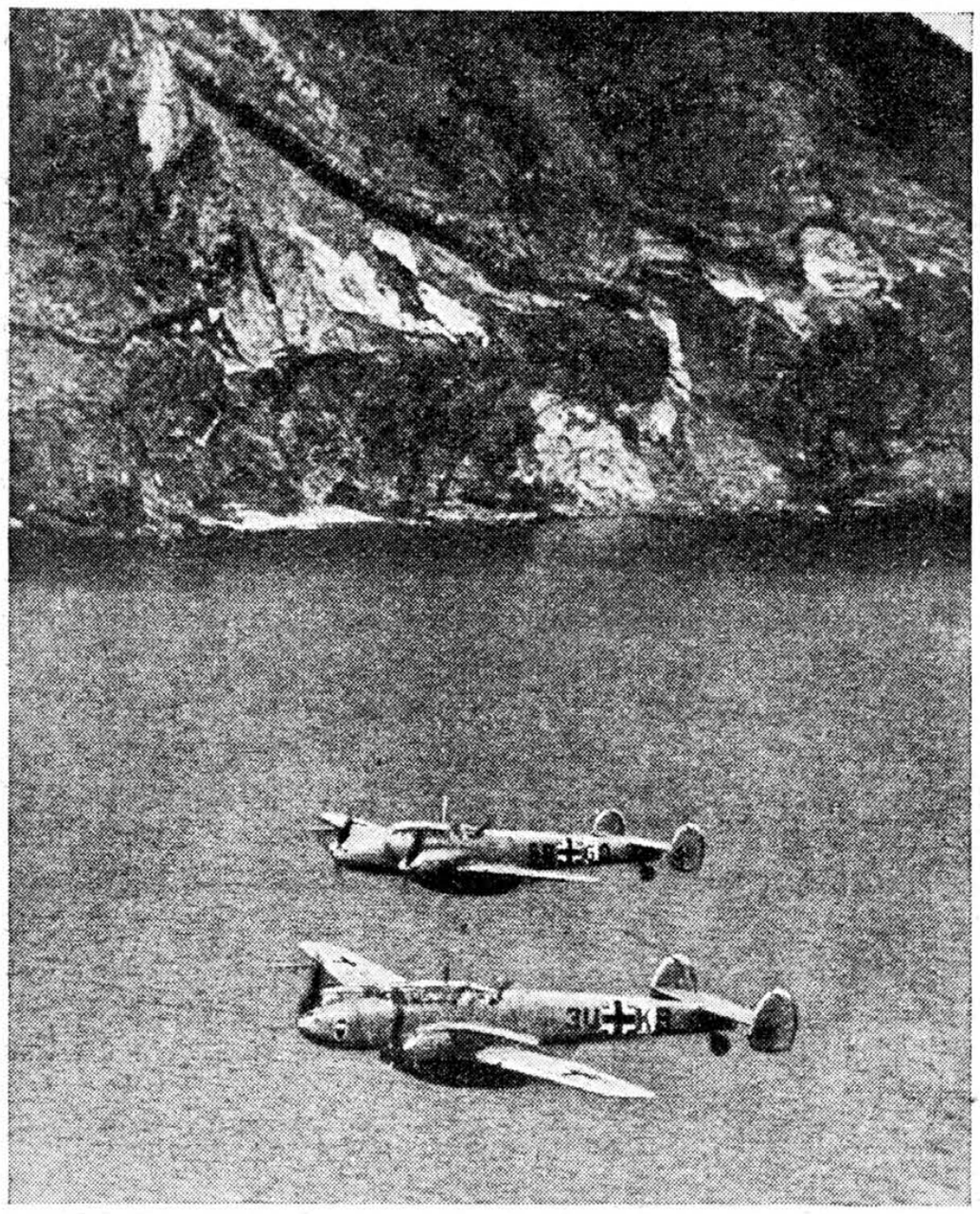
If the enemy could reckon on strong naval cover, his situation would not be so critical. He would have some hope, within fighter range of his own coasts, of disputing any allied project for putting troops ashore to make a bridgehead in his territory. The Italian Navy

has had experience of conflict with the British Navy. Judged by these clashes its prospects of protecting the occupied coasts are not bright. Its submarines have had occasional successes and they may continue to give trouble, but freedom to use the full strength of the Italian Navy is not likely to present itself.

Europe's conqueror therefore is confronted with the dilemma of having to secure himself in the South along a seaboard where he has no marine protection at a time when his main land forces are locked in a heavy struggle with the Russians and spread in a defensive lining around coasts which are nearer the Reich. The projection of his defences of Southern Europe into Africa has been cut away. He must either hurry troops and their air supports into the Mediterranean lands or find a new way of projecting his defence by means of an offensive beyond the boundaries which now lie open to Allied attack. Wherever he may look, the conditions are complicated.

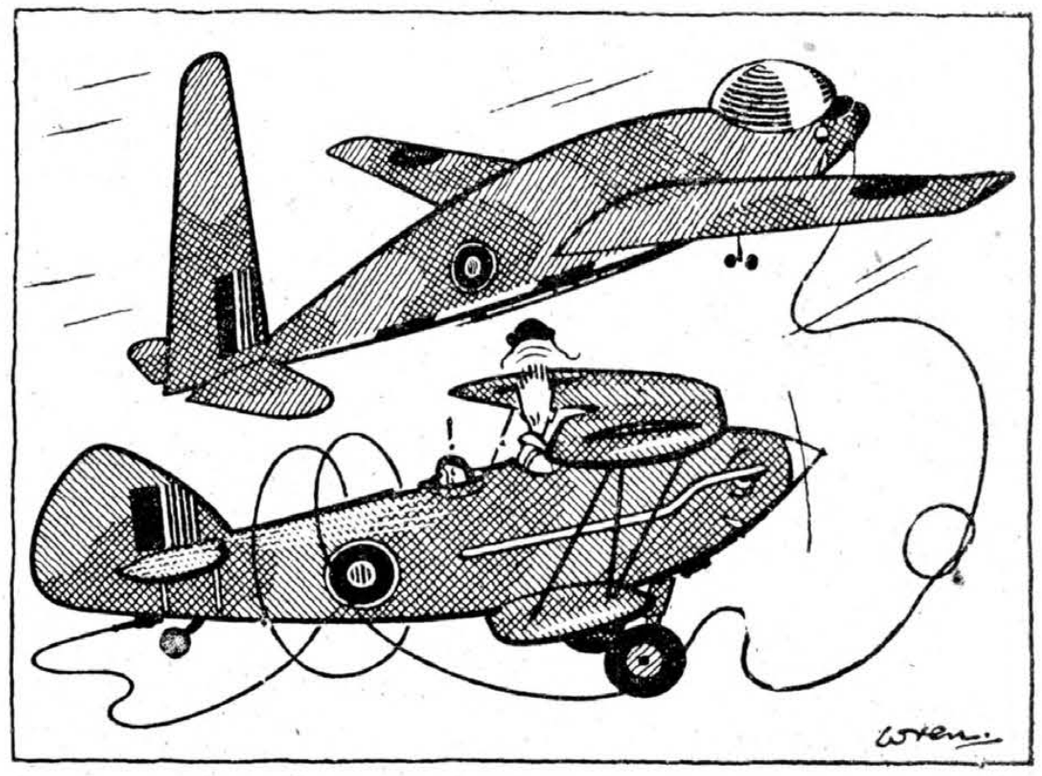
He might like to break into Africa by a new and less difficult route. His claims on the gratitude of Spain for liberation from the Bolshevist bogy might be pressed, but, if the way through Spain were made easy, the way is long and a large slice of France intervenes. The closing of the Mediterranean at Gibraltar must be an alluring idea and desperate men sometimes try desperate remedies. Away at the Eastern end is another area in which the enemy would like to strike at the British. There a less pliable Power stands in the way of a direct attack on the Suez zone; but there, too, a campaign would fit neatly with the operations in Southern Russia.

One thing is sure. Now that the gates have been opened, the course of war will flow fast and heavily in the Mediterranean. The victory in Egypt marks both a release and a revolution. It has given mobility to huge forces and it has opened a variety of channels to them as though the frosts had suddenly gone and given freedom to pent masses. And, as everyone knows, when the snows thaw there are often floods.



ATTENDANTS ON THE CONVOYS.—Messerschmitt Me 110 two-motor long-range fighters over the Mediterranean, where they have been acting as escorts to south-bound Axis convoys and to formations of Junkers Ju 52 air transports flying reinforcements to North Africa.

ODDENTIFICATION—LXXXV



"You are old Father Audax," the young man said
"And I've trailed you too long and too far,
"And still you incessantly keep on ahead,
"Am I always to follow your star?"
"In my youth, young Hotspur," old Audax replied,
"No trailers were hung on my tail,
"And now you've elected to give me a ride,
"Why, stap me, I'll leave you to sail."

A Goad for the Defeated

AIR POWER as the auxiliary of an army is at its best in pursuit. During the retreat of the Axis troops from their prepared positions, Allied aircraft were even more effective than they had been in the defensive fighting of four months ago or in the more recent assault on the enemy's deep defences. When once the enemy's resistance began to weaken, they performed two important tasks in particular. They smashed or dispersed his tank concentrations and they disorganised his transport.

In the first of these duties the air arm made almost as important a contribution to the subsequent course of the operations as it did in the second. Tanks were the things which, above all, the enemy could not hope to replace. They could arrive only by sea; and the torpedo-bombers and the submarines made sure that no ships should arrive at the enemy's African ports while the battle was in progress. Other supplies, including fuel for motors, could be brought by air, possibly by night. Every tank destroyed was a positive and absolute loss. It represented a final diminution in the enemy's power of recovery.

Having helped in the weakening of the enemy's armoured strength, the air forces undertook the work of delaying the retreat and of preventing the retiring forces from establishing themselves at subsequent positions. An attempt to make a stand on the Fuka ridge failed. Another rearguard action at Mersa Matruh was ineffective. The reason was that the British were always on the heels of the defeated army and that the men, tanks and guns which should have withdrawn to the new positions were continuously under attack from the air. The damage done by aircraft as the enemy columns moved westwards was enormous. Time lost to the enemy in consequence confounded his plans as much as the loss of material.

This method of using Air Power has nothing novel in it. It was applied during the Great War in the Struma Valley and the Nablus Pass to make retreat a worse horror than battle. In Egypt, it has been employed in greater strength than ever before against an army which was virtually without air defence. On the day when the retreat began, the air forces made a record number of sorties. The number must have exceeded 1,000. In those operations, the tactical use of the air arm reached its climax. All the desirable conditions were fulfilled. Air superiority had been established, the enemy had been pushed out of trenches and pill-boxes, the warfare had become mobile, and Air Power was available in great strength.

Given those conditions, the air arm can guarantee that a defeated army shall not be allowed to make another stand in formidable array. It is the goad which allows dispirited troops no rest or respite from the pressure of offensive war.

The Arab and His Steed

THE following story is told in " Wings Abroad " of Nov. 4, the weekly R.C.A.F. newspaper. An American sergeant in the R.C.A.F. was transferring to the U.S. Army Air Forces recently and appeared before the American Selection Board, where the following conversation took place:—

" What have you been flying? "

" Wimpeys, Sir."

" Rather ancient aren't they, Sergeant? "

" Wal, Sir, this one's taken me over Germany fourteen times and brought me back fourteen times. It's plenty good enough for me."

The Sergeant is now a 2nd Lieutenant in the U.S. Army Air Forces.

"The Battle of Midway"

THE MOST EFFECTIVE, the most dramatic and the most gripping film yet made of this War was shown privately in London recently. It is the United States Navy's " Battle of Midway," a true account of that great air-sea victory, photographed in colour on the spot.

This film, which runs for about 18 minutes, is a plain, straightforward account of the Japanese attack. There are excellent photographs of Catalinas on patrol above the Pacific, then at the warning of the Japanese approach Boeing B-17Es take off to meet the fleet—magnificently filmed—and, finally, the attack develops. The dive bombing of the island by Japanese single-motor bombers is incredibly well photographed, each bomb burst throwing the camera about at all angles as it is operated from a slit trench. When each enemy dive bomber pulls out from its attack vapour trails stream from its wing tips. The faces of the machine-gunners on the ground as they reply to the bombers reveal vividly all their concentration.

The colour adds greatly to the effect of burning oil dumps, tracer bullets and enemy aeroplanes coming down in flames. Another section of the film illustrates the fighters and torpedo-bombers (Wildcats and Devastators) taking off from a carrier while it is being dive bombed and attacked with torpedoes from the air. Again the effect is terrific.

We understand that " The Battle of Midway " is to be released through the Ministry of Information. We trust that no cuts, alterations or delays are contemplated.—P.G.M.

The Duplex Cyclone

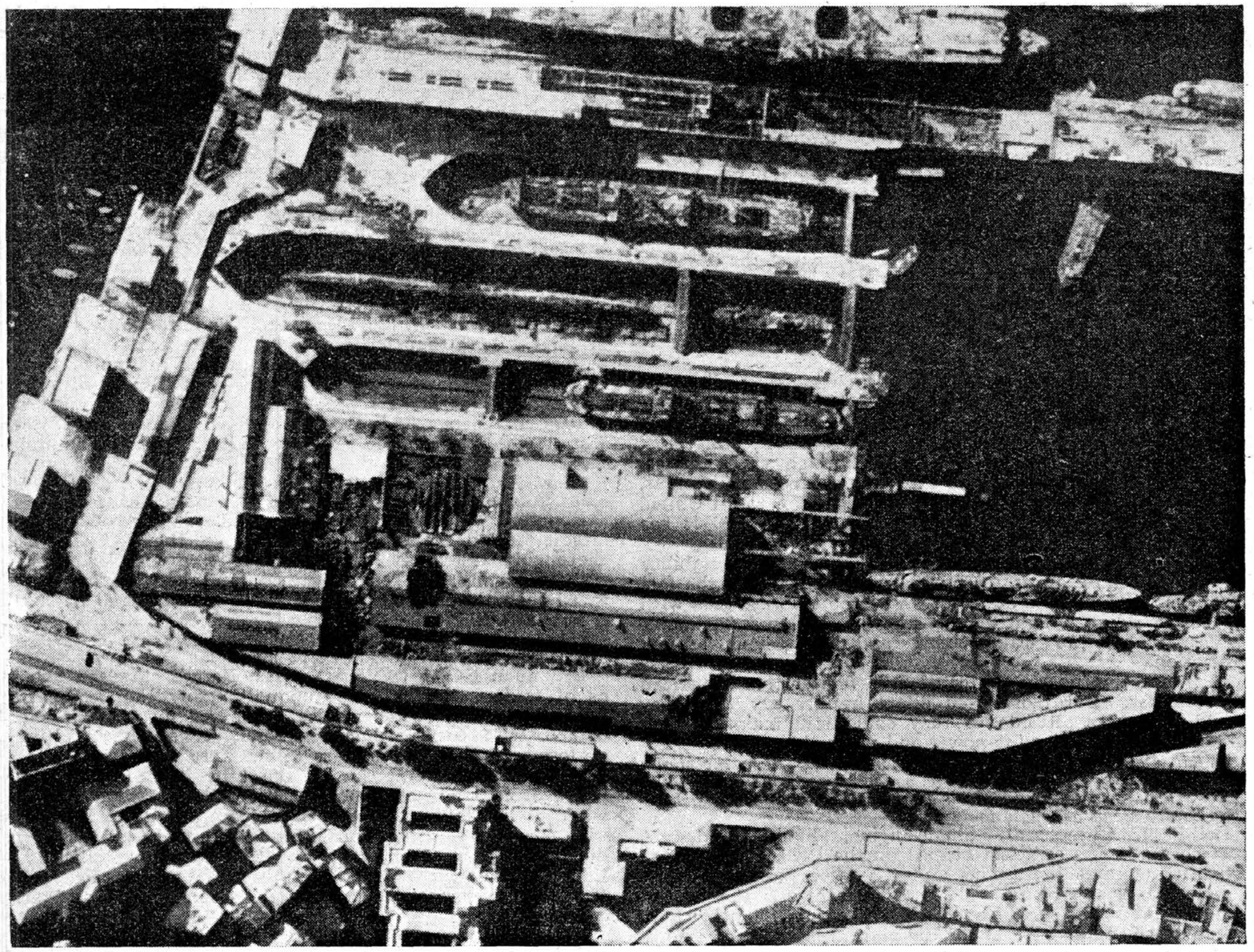
ONE OF the most powerful air-cooled radial aero-motors now in production is the Wright Duplex Cyclone installed in the Martin Mars and the Douglas B-19. A few details of this American aero-motor have been released recently.

The Duplex Cyclone is an 18-cylinder two-row radial with a capacity of 3,350 cubic inches (55 litres). The dry weight is 2,200 lb., which works out at 1.1 lb. per b.h.p. The Duplex Cyclone develops 0.67 h.p. per cubic inch displacement—36.5 h.p. per litre.

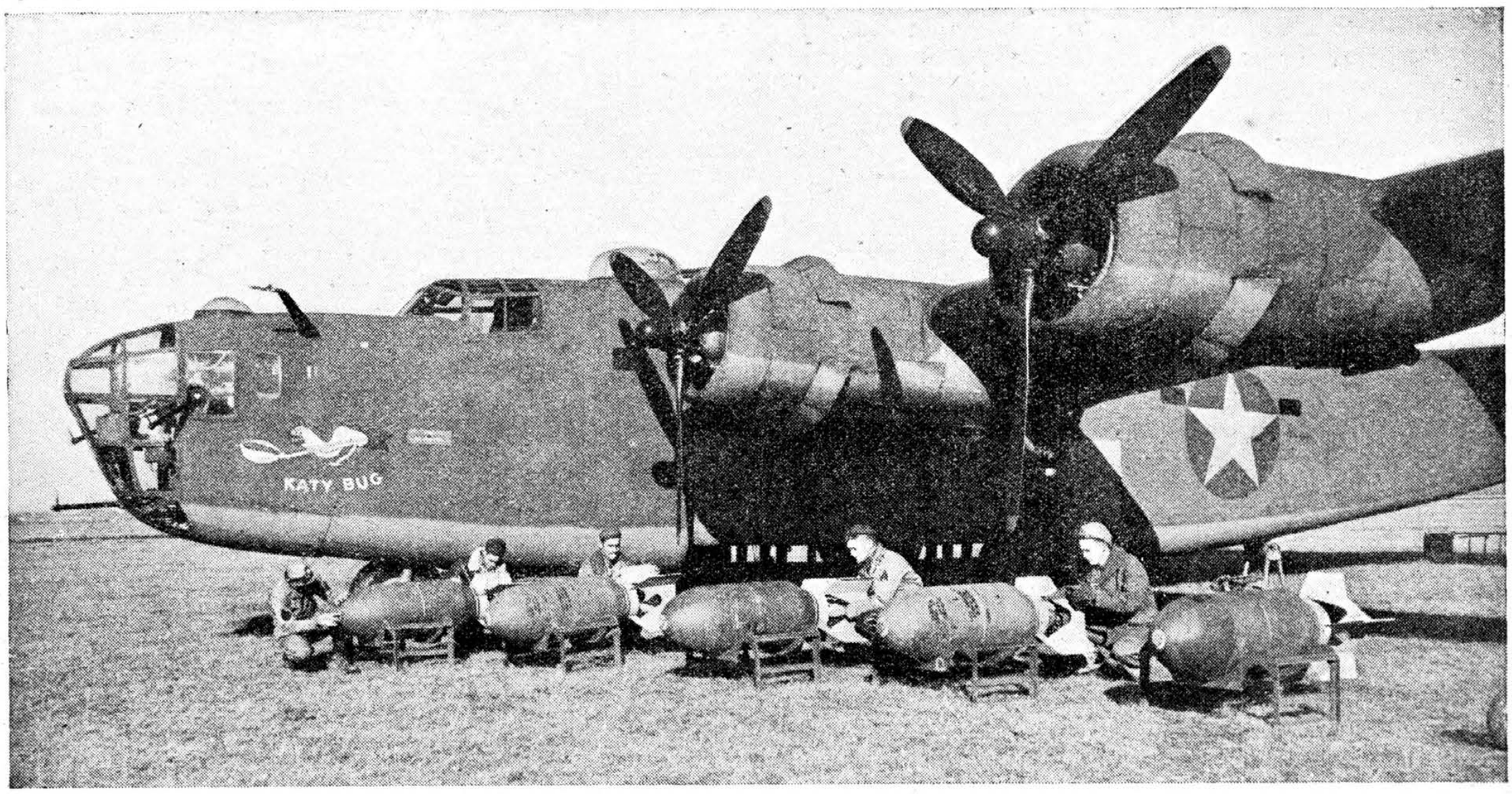
Each of the 18 cylinders has a cooling area of more than 3,000 sq. in., or more than 375 sq. ft. for all 18 cylinders, which is quoted as being double the area of a normal sized living room. Each cylinder develops 112 b.h.p. The cylinders have cast aluminium heads screwed and shrunk on nitralloy steel barrels. The deep, closely-spaced cooling fins are cast with the head and machined on the barrels.

The pistons have tapered rings and grooves, to prevent sticking, and also an inverted oil ring in the piston skirt.

A concentric torque indicator is built into the nose section of the motor and makes possible the determination of the exact output while in the air. Dynamic suspension at the true centre-of-gravity from six rubber-mounted shackles prevents transmission of vibration to the aeroplane structure.



BREAKING THE LIFE LINE.—A reconnaissance photograph of devastation in the Ansaldo fitting-out yard of the Genoa docks as a result of the raid by British four-motor bombers on the nights of October 22 and 23.



AN AMERICAN PACKET.—Five 1,000-lb bombs ready for loading into the belly of a Consolidated B-24D four-motor bomber of the U.S. Army Eighth Air Force operating from England. Three 0.5-in. machine-guns protrude from the nose.

U.S. Verdict on U.S. Aircraft

AMERICAN publicists have recently reviewed their own aircraft critically in the light of much suppressed comment as a result of operations over Europe. Although in many instances American aircraft are operating tactically in conditions for which they were not designed, the fact is that these are the conditions in which they have to fight. Such authorities as Mr. T. P. Wright and his Mission which recently toured this country are under no illusions regarding the good and bad points and will undoubtedly do much to improve the position in the future. With the experience gained in operations over Europe American aircraft in the future will undoubtedly be the equal of any in the World on any mission.

As a supplement to the summary of the statement of the Bureau of War Information which was published in THE AEROPLANE of Oct. 30, we now publish the text of the Bureau's report on specific types of U.S. aeroplanes. This was issued on Oct. 19 with the original statement. We have interpolated our own comments in italics.

FIGHTERS

Curtis P-40.—Single-engine, liquid-cooled. Most discussed of all United States combat aircraft, this fighter has gone through six major type changes (from P-40A to P-40F). Types now in wide use are the "E" (Kittyhawk) and "F" (Warhawk). Substantially improved through each change, it has the virtues of heavy hitting power, excellent armour, high diving speed, and leakproof tanks common to all United States combat aircraft. Against the Mitsubishi S-00 it has proved on average to be superior.

The S-00's advantages of fast climb, great manœuvrability and better ceiling are offset by its vulnerability and the fact that when an S-00 goes down its pilot almost always goes with it. He is riding a lightly built aircraft, highly inflammable—since it has no leak-proofing and is without armour protection.

It is not this poorly protected S-00 fighter that American pilots prefer. But most P-40 pilots frankly say that they would like more altitude, if they could still maintain their advantages of superior fire-power and protection.

[*What is also needed in the P-40 is more speed. Even the Merlin motor cannot make this design the equal in performance of other better streamlined fighters and an armament of six 0.5-in. machine-guns hardly seems adequate to-day.*]

Bell-P-39 (Airacobra).—Single-engine, liquid-cooled. A part sharer in the criticism heaped on the P-40, the P-39 has roughly the same limitations and the same positive virtues. Developments now being made in this design give the promise of much improved performance while retaining all its virtues, including splendid visibility for the pilot in missions co-operating with ground troops. Armed with a cannon as well as machine-guns, it is also a powerful ground-strafing craft.

[*Like the P-40, the Airacobra suffers from the low supercharge of its Allison motor. The view forward is poor because of the steeply sloping windscreen. The tricycle nose wheel has given trouble on muddy aerodromes. Cockpit size is limited. Good, low down.*]

North American P-51 (Mustang).—Single-engine, liquid-cooled. Newest of the Allison-powered United States pursuits, the P-51 has been quietly developed. It did not come prominently into public notice until the British had used it in the raid on Dieppe. One of the fastest fighters in the World, it has roughly the same limitations on altitude performance of other single-engined Allison craft. Improvement in the power plant (treated above) and other technical changes promise a sensational improvement in the altitude performance of this aeroplane.

[*The Mustang looks like being the best American fighter yet produced. With the Allison it has a top speed of 370 m.p.h. and is excellent low down. It was designed to a specification laid down by the British and so has much active experience built into it.*]

Lockheed P-38 (Lightning).—A two-engine, liquid-cooled pursuit aeroplane, the P-38 has so far had only limited tests in action, notably in the Aleutians. Its performance has been brilliant. Turbo-supercharged, it has excellent high altitude performance. Its long range (exceeding the range of the Spitfire, Messerschmitt 109 and Focke-Wulf 190) and its great fire power give it real promise as an escort to our high-altitude bombers. At its best altitude it is one of the World's fastest fighting aircraft. Nevertheless, constant improvements are being made.

[*Single-seaters are not suitable for long-range escort work. Top speed 360 m.p.h.. Reputed to be rather a handful for one man to fly.*]

Republic P-47 (Thunderbolt).—Powered by one of the largest United States air-cooled engines, the P-47 has been thoroughly tested, is in service and in production. It is turbo-supercharged, heavily armed, and has a greater high speed than the P-38 at extreme altitudes. Its trial by battle is not far off.

[*The great weight of the Thunderbolt—round 14,000 lb.—makes it exceedingly heavy for a single-seat fighter.*]

Grumman F4F-4 (Wildcat).—The Navy's standard fighter, as of to-day, the F4F-4 is unquestionably the best carrier fighter now in battle service. Powered by an air-cooled engine, with two-speed supercharger, it has shown altitude performance that comes close to the Zero. Its lower rate of climb and manœuvrability are offset by its characteristically heavy armour and armament. Designed primarily for carrier work, it has folding wings for compact stowage. Like most such specialised installations, this feature steps up the weight of the F4F-4 by 5 per cent. and thus cuts down slightly on its performance. The sacrifice is heavily overbalanced by the fact that it increases a given carrier's complement of fighters by 50 per cent.

In the Solomons, F4F-4s operating against Japanese fighters and bombers have been destructive and in many encounters decisive. Yet superior replacements for the F4F-4 are already in production.

[*The Wildcat—termed the Martlet by the Royal Navy—is an*

excellent machine and has done very well. Its top speed of 315 m.p.h. is good for a naval fighter, but will be far exceeded by the magnificent American Vought-Sikorsky Corsair 366 m.p.h. fighter now coming into service.]

HEAVY BOMBERS

Boeing B-17 (Flying Fortress).—A tried and thoroughly tested model with an unequalled combat record (four engines, air-cooled turbo-supercharged), the B-17 is essentially a high-altitude, long-range bomber designed for precision destruction of restricted targets at great ranges. Often compared, sometimes unfavourably, with the British Lancaster, it is not in the same category.

While it is primarily designed for day bombing, it is easily convertible in the field for night bombing at lower altitudes and shorter ranges, with greater loads. This dual function is not possible with the specially designed slower night bombers.

The Lancaster is designed for night bombing, hence has much less altitude and speed performance, but is capable of carrying a heavier bomb load on short and middle distance missions. In its armament equipment, the B-17 has been most inaccurately characterised as deficient. The fact is that it is one of the most heavily armed bombers in the World.

It has indicated by its work in the Pacific and over Europe as well, that it can carry out high altitude day-bombing missions under the protection of its own guns and without fighter escort. Gunners in Flying Fortresses have shown that its destructive, high-rate .50 calibre machine-guns have greatly extended the effective range of the bomber's defensive fire.

[*Excellent for the work over oceans for which it was designed, the Fortress has done well in escorted raids at short range over France and should prove valuable. European weather sets a serious limit on its constant use in high-level daylight raids.*

This American comparison between the Fortress and the Lancaster is hardly accurate. The Lancaster is faster, carries several times the bomb load and has a longer range than the Fortress. Both will be surpassed by the new Boeing B-29 and Consolidated B-32 bombers.]

Consolidated B-24 (Liberator).—Another four-motored, air-cooled bomber, turbo-supercharged like the B-17 and capable of operation at high altitudes and over great ranges for high-accuracy bombing missions. In the Pacific, in Northern Africa, Europe and the Aleutians the B-24 has shown itself a top-flight performer, capable of duplication of the B-17's record.

[*The remarks on the Fortress apply also to the Liberator.*]

MEDIUM AND LIGHT BOMBERS

North American B-25 (Mitchell).—A battle-tested (two-engine), air-cooled aircraft of speed, long range and good load-carrying characteristics, chiefly dramatised for the United States' public by the raid on Tokyo. No aeroplane of the same class in friendly or enemy air forces is known to equal it.

[*A fine aeroplane, excelled only by the German Dornier Do 217, which is faster and carries a bigger load.*]

Martin B-26 (Martian).—Two engines, air-cooled. This is also a battle-tested aeroplane in general comparable with the characteristics and performance of the B-25. No other Nation, so far as is known, has so efficient an aeroplane in its class.

[*Another excellent aeroplane but apparently deficient in wing area. This makes operation from any but the largest aerodromes difficult with full load.*]

Douglas A-20 (Boston or Havoc).—A light (two-engine, air-cooled) bomber widely used by the British in the European and Egyptian theatres. Flexible in its performance, it has also been employed with modifications as a heavy fighter. It is unquestionably one of the best in its class.

[*A first-class machine which has given magnificent service over France and in the Middle East.*]

THE RETRIEVER.—A "home-made" hydroplane which forms part of the R.A.F.'s "Sea-Air" rescue service on the lakes of the Nile Delta. It consists of a cabin mounted on seaplane floats, is driven by an aero-motor and propeller mounted in the stern, and is steered by an aeroplane rudder. Each of the floats also has a water rudder. The craft can make a good 15 knots.

AIRDENTITIES—XXVII

W. P. Hildred, C.B., O.B.E., M.A.,
Director-General of Civil Aviation.

Douglas SBD (Dauntless).—(Army counterpart A-24.)—The Navy's carrier-based standard dive bomber (single-engine, air-cooled), this craft is the best in the World in its category. As a land-based craft it may find its equal or even its superior in the Germans' latest Dornier and Junkers multi-motored craft. It will shortly be supplemented by a newer design now in production.

[*An excellent dive bomber which has done great work with the U.S. Navy. Now excelled by the Curtiss Helldiver monoplane.*]

Douglas TDB (Devastator).—The Navy's standard torpedo-bomber when we entered the War, this single-engine, air-cooled aircraft was as good as the best in service in any Navy. Yet development already under way soon caught up with it and it is being replaced by the

Grumman TBF (Avenger).—Single-engine, air-cooled. This aeroplane made its battle debut at Midway. A bigger, more powerful and in all respects more advanced aeroplane, the TBF is the best carrier-based torpedo aeroplane so far seen in action in the war.

[*At the top of its class—the best in the World to-day.*]

PATROL AND MISCELLANEOUS

In this field, United States development has been satisfactory in quality. The Navy's patrol bombers are the equals of any in the World, and in range (the basic necessity of the work of such craft) they probably are superior. One of the Navy's types, the famous PBY, has been criticised for lack of speed.

Such craft are not built for speed but for ability to stay long hours in the air and to land on rough water for refuelling and servicing. In these capabilities the PBY is a superior aircraft. Its employment, however, is now overshadowed by later types, notably the new Consolidated and Martin patrol boats.

[*The Catalina is a mainstay of Coastal Command. The newer Consolidated Coronado is probably the best all-round patrol boat in the World at present.*]

In the Army Air Forces the requirements of an aeroplane for every task have brought into the military field many aircraft not mentioned in the foregoing summary. They range from troop carriers and transports down to the "grasshopper" aeroplanes for liaison, fine artillery fire adjustment, etc.

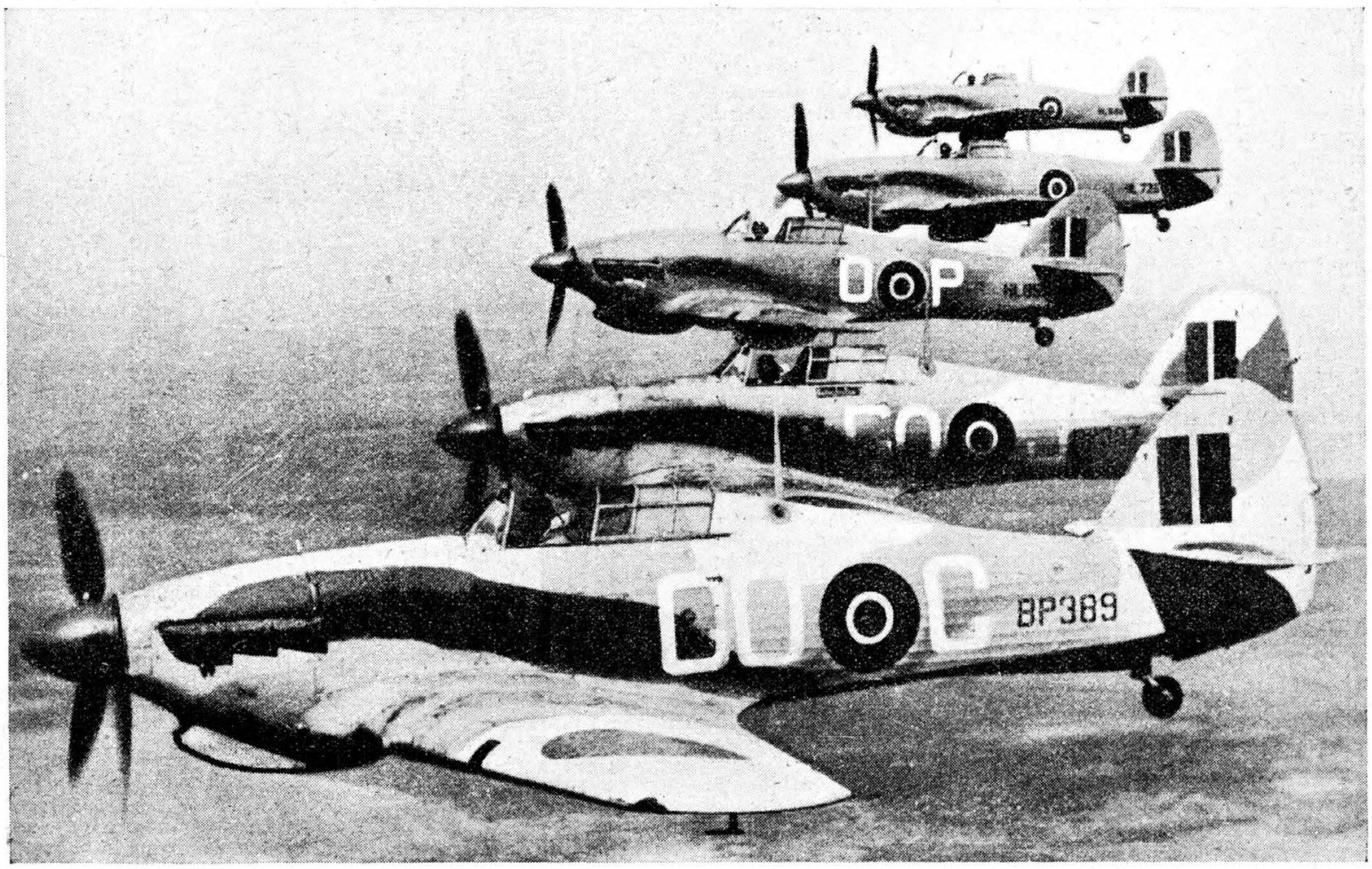
These types are very good, on the average, and many of the newer craft are definitely superior to comparable equipment in other air forces. Rising production in this general category should give the United States Air Forces the best equipment of this kind in the World.

[*In this brief survey the U.S.A. is shown to be deficient in fighter development and ahead of the World in Naval aircraft and transports. The present American heavy bombers have several important tactical drawbacks which outweigh their many good features when operating in European conditions. The newer American heavy bombers should lead the World and be capable of meeting and exceeding every possible call upon them.*

On the basis of this survey, British fighter production, the present production of British heavy bombers and the future production of American heavy bombers should give the United Nations unrivalled performance in every category.]

The 166th Week of

THE WAR IN THE AIR



ON ROMMEL'S TRACK.—A formation of the latest type of Hurricane II fighter, wearing desert camouflage and markings, flying over the desert. The ageless Hurricane has seen longer front-line service in North Africa than any other type.

MORE MOMENTOUS happenings than any since the War began packed the past week. The offensive stage for the United Nations is beginning. There will be hard times still to come, but the tide is on the turn.

Rommel's Afrika Korps appears to be broken and in full retreat. American Forces under General Eisenhower have landed in French North Africa at Casablanca, Oran, Algiers and several other points. The Axis is about to be thrown out of North Africa. The whole of the Southern coastline of the Mediterranean may come into Allied hands as a springboard for an assault on the homelands of the enemy.

The air has played a major part in these successes of the past week—as it will in turning the success to full account. The Allied Air Forces of the Middle East Command have established air mastery over the retreating enemy forces on the Egyptian border. Aircraft of the Royal Air Force and the Royal Navy covered the American landings on November 8. They are now established at new air bases from which control of the Mediterranean can be won.

The fashion of the moment is to say that in Africa the British land and air forces are one. This is true in so far as they are both fighting the same campaign, but it is not true in detail. The land forces are fighting on a comparatively small front—the air forces are making their contribution not only over the battlefield itself but far and wide over the whole of South-Western Europe and the Mediterranean. The heavy raids on Germany by home-based bombers, the sallies from Malta, the pounding of Tobruk, all give direct support to the armies in Egypt. Another fashionable saying is that, for the first time the R.A.F. is giving full co-operation to the Army. Such remarks do less than justice to the gallant work done by the R.A.F. in the past. The support was not always everything which was required simply because the necessary aeroplanes did not exist. But the spirit of co-operation was always there. This time so were the aeroplanes. The result has been devastating.

Air support above a land battle becomes most damaging when the enemy are in retreat. The wrecking of the withdrawing columns of the Afrika Korps, the smashing of hundreds of enemy aircraft on the ground, are evidence of the destruction which can be wrought where air mastery is gained over a beaten force. Now the assaults on the routed French armies in 1940 are avenged. The retreat to Dunkirk was less heavily pounded than the Rommel forces have been.

Air cover above the landings in French Morocco and Algeria has eased the position enormously. Vichy had reported four Allied aircraft carriers at Gibraltar. They held aircraft to cover the occupation. Against a strongly defended coastline containing adequate land-based air power, such action would have courted disaster. Although the bulk of the Vichy French Air Force is in North Africa, there was little need to regard its probable resistance seriously. Some of the aeroplanes are good; many of them are American. There are Curtiss Hawk 75As, Douglas DB-7s, Martin 167s, as well as the Dewoitine D.S20s, Breguet 691s, Potez 63-11s, LeO 45s and Bloch C.151s. But these aeroplanes have not been flown much for the

past two years. Spares are insufficient, ammunition and fuel scarce.

The most important immediate results of the gains in the West and East of the North African coast are the establishment of new air bases. Already Malta's position is greatly improved. Now we shall have need of every aeroplane we can muster. The Luftwaffe is stretched, but our commitments, too, are increasing. As the ring tightens on Germany, so the concentrations can be increased again. For a while the long outer lines which we are holding will extend our resources to the limits, from India through Africa to Great Britain, from Australia across the Pacific, through America to Africa.

In all the magnificent gains of the past week, perhaps the most important feature of all is the eclipse of the Axis in the air. Compare the position in 1940 with to-day. The enemy will yet strike back, but his air inferiority is the mark of doom.

Stirring Days in North Africa

HARD UPON THE TIDINGS that the Eighth Army had broken through Rommel's defences at El Alamein and were in pursuit of the fleeing enemy came the announcement that American forces had landed at many points in French North Africa.

First news of the Eighth Army's smashing victory was given in a special Joint War Communiqué issued at 22.00 hrs. on Nov. 4; the landing of the American troops was disclosed in a communiqué issued by Allied Forces Headquarters at 02.25 hrs. on Nov. 8.

The collapse of organised resistance by the German Afrika Korps and the Italians after the Eighth Army had broken through the deep and well-laid defences running westward from El Alamein was swift and catastrophic. A large enemy force was cut off and isolated by an Australian Division between the railway and the coast a few miles West of El Alamein. The bulk of this force was taken prisoner. Among those killed on the battlefield was General von Stumme, a senior General who is said to have been in command during Rommel's absence in Germany. Among those taken prisoner was General Ritter von Thoma, Commander of the German Afrika Korps, and a number of other senior German and Italian officers.

While retreating, the enemy attempted to fight delaying actions, but the Eighth Army maintained a fast pace and at the week-end had passed to the South of Mersa Matruh (100 miles West of El Alamein) and were approaching Halfaya Pass on the borders of Egypt and Libya.

A communiqué from Cairo stated that more than 20,000 prisoners had been taken, together with 350 tanks, 400 guns and many thousands of vehicles. When these figures were issued, large numbers of Italian troops were still waiting to be rounded up from the Southern sector, where they had been sent to draw off the Eighth Army and then deserted by the Germans when the ruse failed.

Operations by the Allied Air Forces, involving every type of weapon from fighters to heavy bombers, were kept up night and day. Thousands of sorties were flown over the battle area, to the Axis supply ports, over the Mediterranean and against aerodromes in Crete. Landing grounds in North Africa were frequently assailed, and many enemy aeroplanes put out of action by ground-strafing fighters. When the Axis retreat became a rout, bombers, fighter-bombers, and long-range fighters swept down upon the congested roads leading to the West and spread destruction along their entire length. Meanwhile, fighters kept guard against Luftwaffe raids on the Eighth Army's positions.

In a forlorn attempt to check the speed and weight of the Allied advance, the Luftwaffe rallied its few remaining Stukas and sent them, well escorted with Messerschmitt Me 109s, into the Allies' air. They were badly mauled, and in four days 22 Ju 87s and five escorting Messerschmitts were shot down. The damage they did was negligible. On Nov. 5, there were no Stuka raids, and on the two following days evidence that the Luftwaffe and the Regia Aeronautica still existed as a fighting force in North Africa was difficult to find.

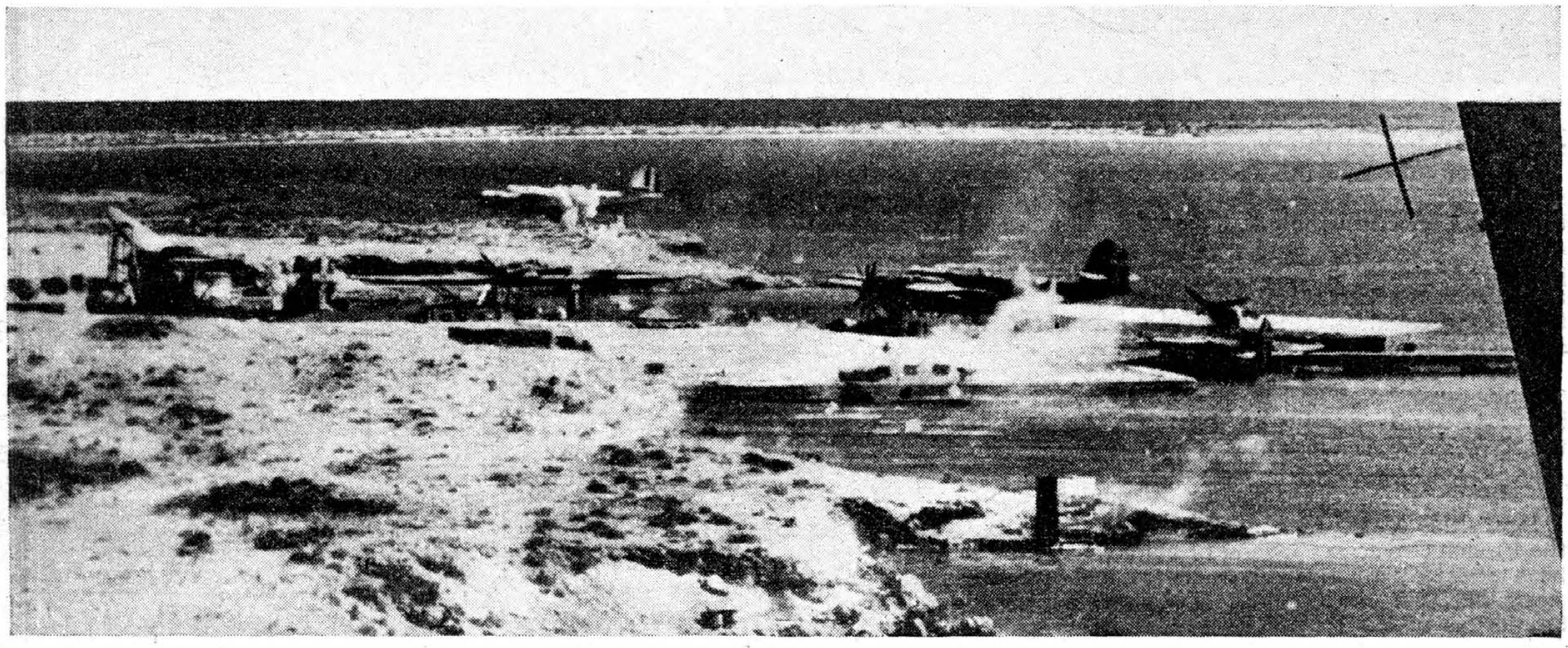
Airborne troops were apparently used in the offensive on a small scale, but no details of their part were disclosed. A detachment of the R.A.F. Regiment captured the aerodrome at El Daba, on which were found 100 German and Italian aeroplanes, including gliders, in varying degrees of unserviceability as the result of air attacks.

Torpedo-carrying aeroplanes had another satisfactory week. Early on the morning of Nov. 1 they sank two merchant ships which were about to enter Tobruk harbour. On the following day they hit two destroyers and set fire to a medium-sized merchant vessel North-west of Tobruk, and possibly hit another. Hits were scored on a heavily laden merchant vessel and on a tanker, on the night of Nov. 3-4. Three hits were also made on escorting destroyers and an enemy schooner was attacked off the coast of Southern Sicily. These successes were additional to those recorded by heavy bombers which made daylight raids on Benghazi and Tobruk during the week.

Malta had another quiet week with long intervals between alerts. Two enemy fighters (an Me 109 and a Macchi C.202) were destroyed, the Me 109 by machine-gun fire from the ground.

The landing of American troops in French North Africa was made with the co-operation of the Royal Air Force and the Royal Navy. The principal landing points, according to Vichy, were Oran and Algiers, in the Mediterranean, and Casablanca, on the Atlantic coast. The operations were covered by a strong fighter screen, presumably flown off aircraft carriers. Airborne troops were also engaged; their task was to capture certain aerodromes and communications. Royal Air Force aeroplanes flew over the territory involved dropping leaflets explaining that the invasion was being made to forestall a similar invasion by the Axis. At the same time, Allied transmitters sent out messages from President Roosevelt, the British Government and General Dwight Eisenhower (who commanded the American Expeditionary Force) explaining the purpose of the Allies and declaring their intentions.

Shortly after the communiqué from Allied Forces Headquarters had been received, an announcement was made that



A SEAPLANE STRAFE.—Axis seaplanes with Regia Aeronautica markings being made unairworthy during a low-flying attack by the R.A.F. operating from Egyptian bases. In the photograph are four Cant Z.501s and two Cant Z.506Bs.

SMALL ARMS AMMUNITION.—Armourers filling the magazines of the .303-in. machine-guns of a Supermarine Spitfire VB belonging to the Fighter Command of the U.S. Army Air Forces on an aerodrome in England.

many divisions of the British Army were on their way to reinforce the Americans. No details of the progress of the operations were available at the end of the period covered by this review.

Red Army Halts the Axis

Another pause and another push failed to win the Axis an inch of ground at Stalingrad. Red Army counter-attacks, on the other hand, improved the defenders' positions inside the city. Pressure from Soviet relief forces to the South and North-west continued; more progress was made by the Russians North-east of Tuapse, and an Axis drive in the Central Caucasus, which at one time threatened to grow serious, was slowed down and finally halted after the Russians had massed artillery at the danger spot. A sudden renewal of the enemy's thrust towards the Grozny oilfields, which was interrupted while the Nalchik operations were in progress, met with no success. Elsewhere on the Russian front only local fighting occurred. Meanwhile Berlin once more reported the assembly of strong Russian forces along the entire length of the front from Moscow to Leningrad, and again forecast the opening of a new Red Army offensive as soon as the weather was suitable. Such units of the badly stretched Luftwaffe as could be spared were sent to bomb railways and troop concentrations in these areas.

Signs were not lacking, last week, that the Red Air Fleet was recovering its strength. In a single day, Russian fighters shot down 13 Axis raiders at Stalingrad and disposed of 14 German tanks and 17 raiders in the Central Caucasus sector.

No diminution in the strength of the Luftwaffe's bombardment of Stalingrad could be detected, but a marked deterioration was noticed in the quality of the soldiers used for the land attacks. This fact, coupled with the enemy's failure to make progress anywhere but in the Central Caucasus and his inability to prevent the Red Army from reclaiming positions here and there, suggested that the tide was about to turn in Russia as it had turned in North Africa.

Moscow's statement of the week's air losses claimed that 158 German aeroplanes had been shot down in combat, destroyed by anti-aircraft gunfire or destroyed on aerodromes, against the Red Air Fleet's loss of 63 aeroplanes.

Madagascar Surrenders

Hostilities ceased at 14.00 hrs. (local time) on Nov. 5, after the French Governor-General of Madagascar had requested, and been granted, an armistice. There had been only one small clash between British and Vichy troops during the week. Squadrons of the Royal Air Force and units of the Fleet Air Arm had taken part in the operations, giving close support to the land forces and undertaking the bombing and machine-gunning of Vichy-French troops holding fortified positions or engaged in building road blocks.

Allies Dominate Papua

American troops, flown to Papua from Australia and then thoroughly trained in jungle warfare, occupied strategic positions in Northern Papua recently. Their presence, and the success of the Australians' advance from the Owen Stanley Range, put the Allies in control of all Papua except the Buna-Gona district.

Kokoda was retaken by the Australians on Nov. 2, after three months of hard fighting. The Japanese made a bid to land reinforcements the same day, but the convoy was heavily bombed and one of the ships set on fire. Later, this vessel was seen to be drifting off Gasmata, still burning and apparently a total wreck. At the week-end, the Australians were meeting strong enemy opposition near Oivi, some miles North of Kokoda. In this area, the Kumusi River may provide the Japanese with excellent natural barriers.

Lae and Salamaua (New Guinea) were both bombed by Allied Air Forces during the week, Lae with particular severity.

More attempts were made by the Japanese to regain their hold on Guadalcanar. They succeeded on the night of Nov. 2-3 in landing more reinforcements on the Island to the East of the Henderson aerodrome, which is their primary objective, but failed to profit by the operation. The Americans, in fact, improved their positions early in the week and pushed the enemy back still farther on Nov. 7. Their bombers and dive bombers were active both against the enemy on Guadalcanar and against targets in the surrounding islands. Dilli and other places in Dutch Timor had raids on four successive days, and shipping in the roadsteads between Buin and Faisi were twice heavily attacked.

A Japanese raiding force of 27 bombers and fighters attacked American positions at Guadalcanar in cloudy weather on Nov. 5, and although they escaped interception they did no damage to the aerodrome or its buildings.

Allied forces cleared the Japanese from strategic positions North of Milne Bay, and occupied several themselves.

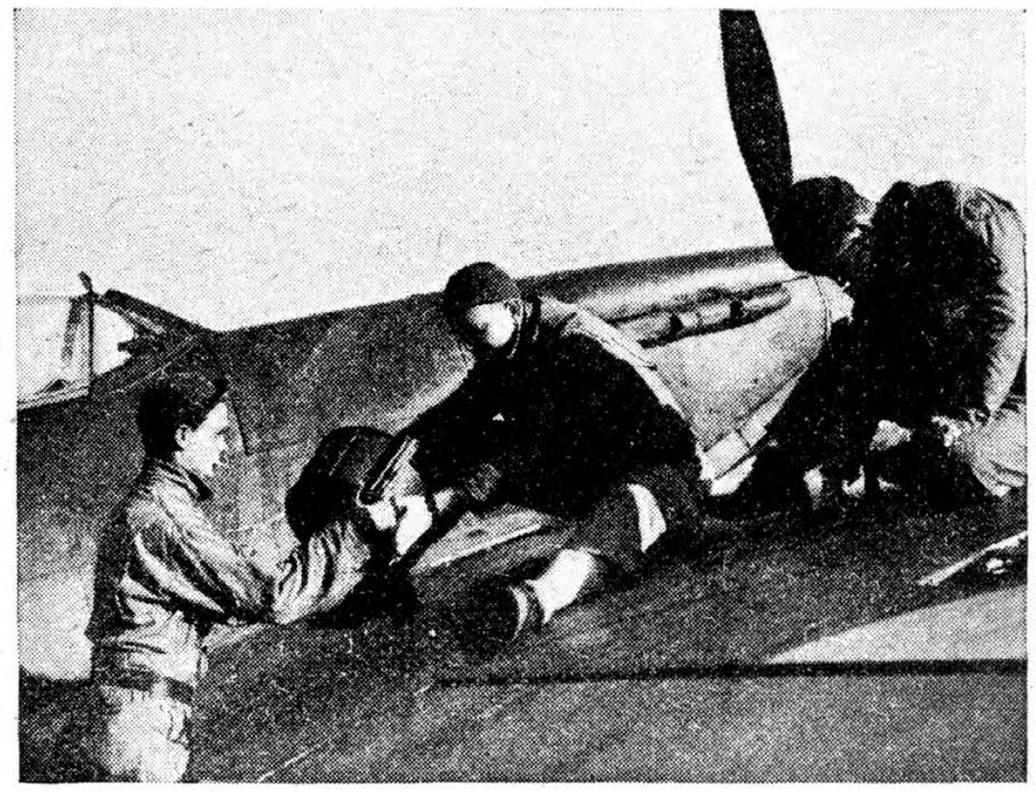
No air activity was reported from China during the week. Patrol clashes resulting in casualties to the Japanese occurred on the borders of India and Burma.

Genoa Revisited

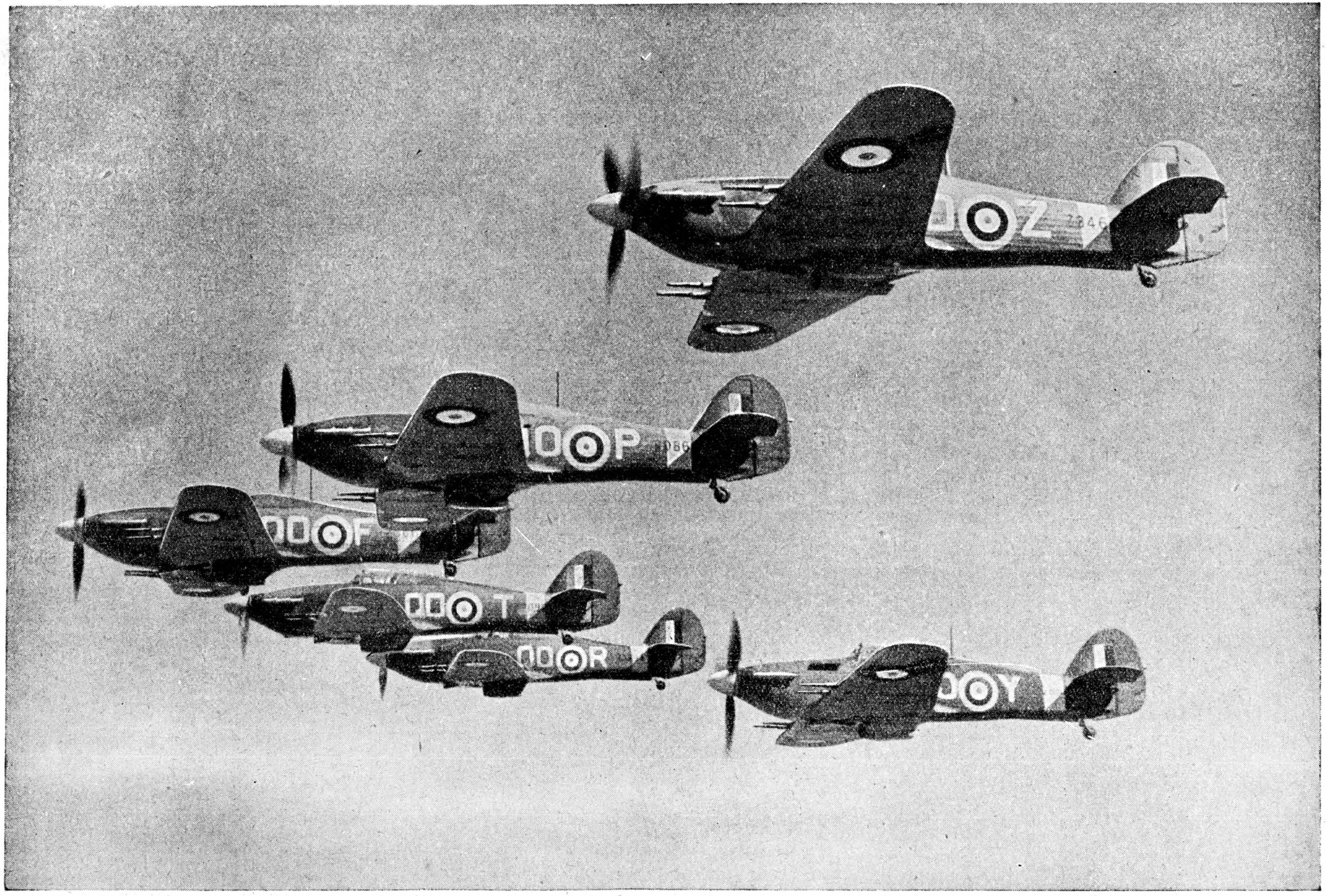
Two more heavy raids were made by home-based bombers on the Italian port of Genoa. Both were successful. In the first, the weather over the route was bad, but over the target it was good. In the second, which was a heavier raid, conditions were again good for bombing, and crews were able to observe many of the results of their attacks.

These two raids came at the end of a week in which the night bombers in Britain had been prevented by the weather from delivering more of their long-arm punches in support of the Eighth Army's offensive from Egypt. Although they were delayed a few days, they lacked nothing in weight when they went, and even the Italians admitted that much damage had been done. That impression had been gathered by the raiding crews.

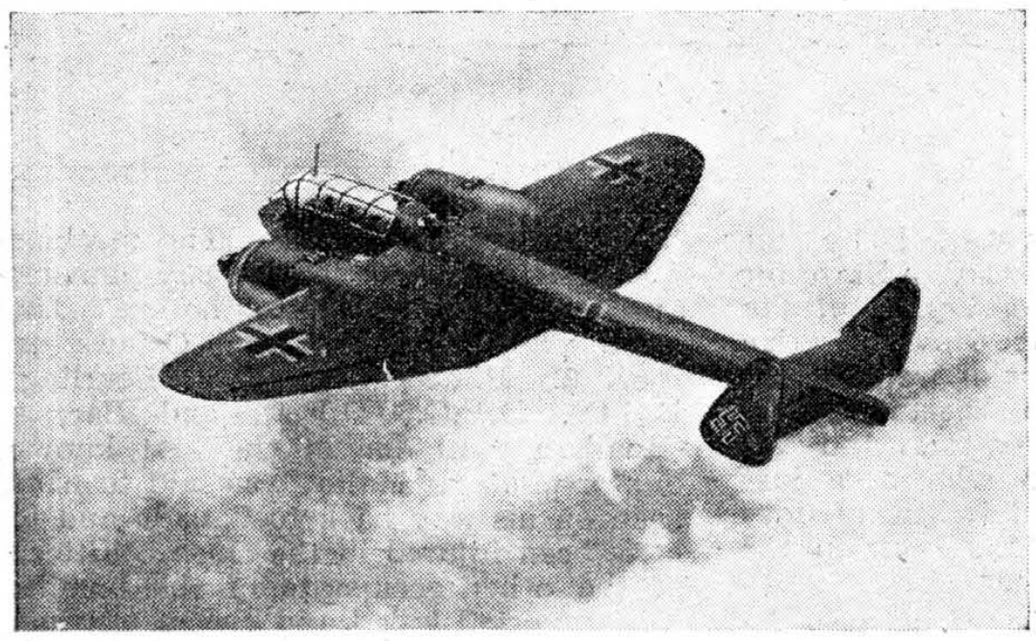
Persistent clouds gave opportunities for individual bombers to continue their daylight attacks on Germany. Lancasters and Wellingtons made their way to Germany and Holland—once as far as Osnabrück—to bomb selected targets. Spitfires were out every day but two, sometimes on offensive sweeps and



BIGGER STUFF.—A drum of shells for one of the two 20-mm. cannon in the same Spitfire VB. The cannon are loaded from above, the machine-guns from below.



The Hawker Hurricane, termed the World's greatest fighter, has been re-vitalised. The new Hurricane II has a more powerful version of the Rolls-Royce Merlin engine and the exceptional armament of either twelve machine-guns or four cannon. The photograph shows a formation of Hurricane IIC's (the four-cannon type) on patrol. [*Advt.*



THE LATEST JUNKERS.—A model of the Junkers 288 made by a reader of "The Aeroplane" from silhouettes published recently in "The Aeroplane Spotter." Though developed from the Ju 88, it is radically different. The motors are believed to be BMW 801s. The twin fins and rudders are specially noteworthy from a recognition point of view.

sometimes on escort duty. U.S. Army Fortresses and Liberators raided Brest under their protection; Bostons attacked aerodromes in Northern France under escort, and an aerodrome and a factory, flying singly.

Beaufighters of Coastal Command again distinguished themselves by shooting down two Junkers Ju 88s sent to oppose Wellingtons and Whitleys on anti-submarine patrol over the Bay of Biscay. These and other offensive operations of the Fighter, Coastal and Bomber Commands of the Royal Air Force and of the U.S. Army Air Forces in Britain, are summarised on this page.

Most of the Luftwaffe's offensive operations against Britain were also made by day. Fighter-bombers, and a few Junkers Ju 88s, flew in coastal regions and caused some damage and casualties at widely separated places. No more attempts were made to "avenge" any of the R.A.F.'s recent raids on Germany, Italy or occupied territory.

Diary of the Week

Offensive Operations of the Fighter, Coastal, Army Co-operation and Bomber Commands of the Royal Air Force and of the U.S. Army Air Forces in Britain. From November 1 to 7, 1942

Sunday, November 1

DAY .. Spitfires of Fighter Command on offensive patrol attacked canal barges in Holland; Bostons attacked an aerodrome and a factory in Northern France. One bomber and one fighter lost. Two Junkers Ju 88s shot down into the sea over the Bay of Biscay by Beaufighters of Coastal Command.

Monday, November 2

DAY .. Spitfires of Fighter Command destroyed four Focke-Wulf Fw 190s during offensive sweeps over Northern France. Two Spitfires lost.

Tuesday, November 3

DAY .. Spitfires made many attacks on locomotives and other objectives in Northern France and the Low Countries. Stirlings attacked industrial and railway objectives in Western Germany; other bombers attacked communications in Holland. Two out of four enemy fighter-bombers which attacked a place on the South-west coast of England were shot down by R.A.F. fighters.

Wednesday, November 4

DAY .. One Ju 88 destroyed over the North Sea by R.A.F. Spitfires.

Thursday, November 5

DAY .. Enemy bomber (Do 217) destroyed by anti-aircraft gunfire over Great Britain.

Friday, November 6

DAY .. During morning, Spitfires attacked gasworks in Holland and aeroplanes of Bomber Command attacked objectives at several places in North-West Germany, including Osnabrück. In the afternoon, 200 Spitfires of Fighter Command made a three-pronged sweep over occupied France, covering area from Cherbourg to Boulogne. One force escorted Bostons to bomb German aerodromes in the Caen area. Aeroplanes of Bomber Command attacked enemy shipping in Dutch harbours. Three bombers lost.

NIGHT .. Main target: Genoa (Italy) by large force of four-motor bombers. Two lost.

Saturday, November 7

DAY .. Escorted Fortresses and Liberators raided the docks at Brest. Four enemy fighters shot down. One escort fighter lost. R.A.F. fighters and fighter-bombers, including aeroplanes of the Army Co-operation Command, made low level attack on enemy communications in occupied territory. Seventeen goods engines were damaged or destroyed. R.A.F. bombers attacked enemy shipping in the Gironde, and factories and railway targets in Belgium and Holland. One fighter and three bombers lost. Two Fw 190s collided when trying to escape from a Fighting French pilot of Fighter Command, and crashed into the sea.

NIGHT .. Main target: Genoa (Italy) by a force of bombers larger than that used the previous night. Four bombers lost. Aeroplanes of Fighter Command flew intruder patrols over Northern France. One fighter lost.

U.S. ARMY AIR FORCES IN GREAT BRITAIN

The U.S. Army Air Forces in Great Britain suffered no losses in their Bomber Command operations during the week. Total losses therefore remain at nine bombers and seven fighters, and the number of enemy victims reported at 99 fighters.

AXIS AND ALLIED LOSSES—NOVEMBER 1-7, 1942

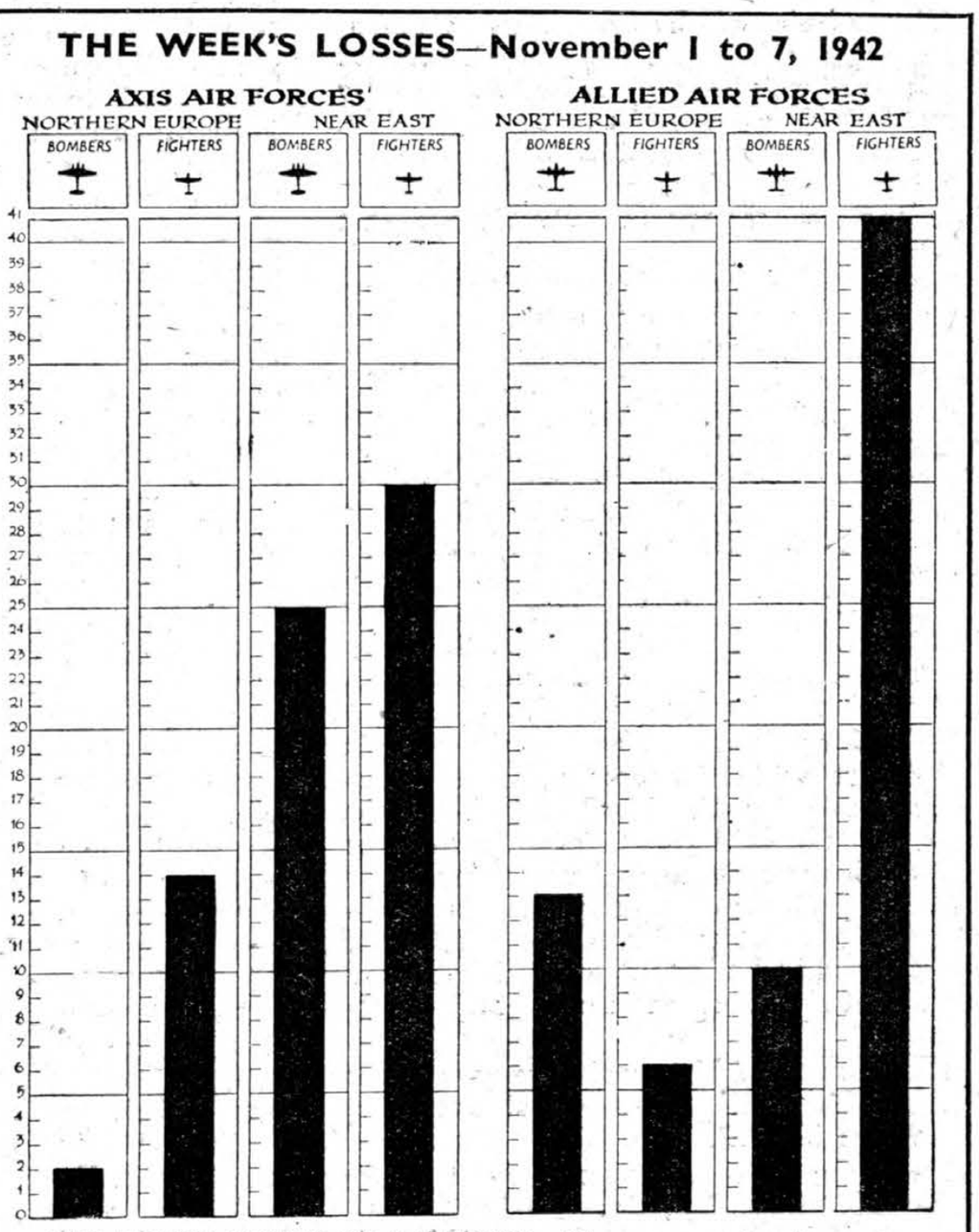
Date	Axis (N. Europe)		Axis (Near East)		Allied (N. Europe)		Allied (Near East)	
	Machines	Personnel	Machines	Personnel	Machines	Personnel	Machines	Personnel
1-11-42	2	8	8	15	2	4	2	2
2-11-42	4	4	12	17	2	2	13	24
3-11-42	2	2	15	23	—	—	16	28
4-11-42	1	4	13	23	—	—	14	28
5-11-42	1	5	7	12	—	—	4	2
6-11-42	—	—	—	—	5	33	2	—
7-11-42	6	4	—	—	10	49	—	—
Tools	16	27	55	90	19	88	51	84*

* Excludes 6 pilots saved.

TOTAL LOSSES IN THE AIR WAR* (To dawn, November 8).

	Axis Air Forces	Allied Air Forces
Machines destroyed in combat or by A.A. gunfire	10,387	6,986
Personnel	27,263	21,131

* Excluding Russia and the Far East.



THE WEEK'S LOSSES AT A GLANCE.—The comparative losses in Air War for the week November 1 to 7, 1942, inclusive. The chart does not include aeroplanes destroyed in Russia and the Far East, or those destroyed on the ground. The figures for Northern Europe are: Axis (daylight offensive) 2 bombers and 4 fighters; (defence by day) 10 fighters; Allied (daylight offensive) 7 bombers and 5 fighters; (night offensive) 6 bombers and 1 fighter. The figures for the Near East are: Axis, 25 bombers and 30 fighters; Allied, 10 bombers and 41 fighters. Approximate personnel losses are: Northern Europe: Axis, 27; Allied, 88; Near East: Axis, 90; Allied, 84.

NEWS OF THE WEEK

THE AXIS FORCES in the Western Desert were in full retreat on Nov. 4 after 12 days and nights of ceaseless attacks by Allied land and Air Forces. H.M. the King sent a message of congratulation on these achievements to General Alexander, C.-in-C., Middle East. In it he mentioned especially the work of the R.A.F. and Allied Air Forces, and expressed his thanks to Air Chief Marshal Sir Arthur Tedder, General Montgomery (Commander of the Eighth Army), Air Vice-Marshal Coningham and all ranks of the three Services.

U.S. forces, supported by British Naval and R.A.F. forces, landed at Algiers, Oran, Casablanca and other points on the Mediterranean and Atlantic coasts of French North Africa during the night of Nov. 7-8. Aerodromes at Algiers and Oran were captured and immediately occupied by U.S.A.A.F. and R.A.F. fighter squadrons. Algiers capitulated at 20.00 hrs. on Nov. 8. The landings were led by U.S. Rangers (Commandos) and were followed by parachute troops. Lt.-Gen. Dwight D. Eisenhower is C.-in-C. Allied Operations and Brig.-Gen. J. Doolittle is in command of the U.S.A.A.F.

An Allied Force Headquarters was stated on Nov 8 to have been set up in London some months ago by direction of the Combined Chiefs of Staff in Washington. General Eisenhower was designated C.-in-C., Allied Forces, and a staff of British and American officers was selected.

The whole of Papua, New Guinea, except for the coast around Buna and Gona was retaken by Allied Forces by Nov. 8. Kokoda was captured on Nov. 2. American ground troops were stated to have been taken in force by air to join the Australians in New Guinea last month.

During October 369 enemy aeroplanes were destroyed in the South Pacific area according to a statement made by the U.S. Navy Department on Nov. 8.

Lt.-Gen. G. H. Brett assumed command of the U.S. Caribbean Defence Forces on Nov. 4 in succession to Lt.-Gen. F. M. Andrews, who has taken command of the U.S. Middle East Forces.

Hostilities in Madagascar ceased at 14.00 hrs. (local time) on Nov. 5, at the request of the French Governor-General, and an Armistice was signed.

British equipment was mainly used in the desert victory according to a statement made by President Roosevelt on Nov. 6. He said that a certain number of American tanks and aircraft were used but that General Montgomery's army was equipped only to a minor degree, by which he said he meant a good less than half, with American tanks and aeroplanes.

The twenty-fifth anniversary of the Soviet Republic was celebrated in Russia on Nov. 7.

The ownership and management of the National Steel Car Corporation, Ltd., Aircraft Division at Malton, which is building Lancaster bombers, has been taken over by a specially formed Crown Company in Canada. This was announced by the Canadian Munitions Department on Nov. 5.

Brazil is training parachute troops and the first course of instruction was reported to have started at Sao Paulo on Nov. 4.

H.M. The King, attended by Sir Archibald Sinclair, Secretary of State for Air, visited a Receiving Centre of the R.A.F. in London on Nov. 5. He inspected 200 recruits who were beginning their training to become pilots, observers, wireless operators and air gunners, and saw men who were just joining, others who had joined 10 days before and some who had been in the Service for three months.

A large number of new aerodromes, the sites for which have been carefully chosen in co-operation with the Army for their defensive as well as their offensive positions are being built in Southern India, according to a report from the special correspondent of "The Times" on Nov. 5. The runways and aerodromes are said to be practically hand-made by Indians who are doing work for which machines are used in Great Britain and the runways and buildings are built to a standard pattern under the technical supervision of military engineers. Bangalore is said to be the nerve-centre of the Southern Army and Air Force.

Bomber Command of the R.A.F. operated offensively over Europe on 11 nights and 21 days during October, including raids on Germany on seven nights and nine days, over Northern Italy on three nights and one day, and over Occupied territory on 10 days. Fighter Command was over enemy-occupied territory repeatedly by day and by night and, in addition to escorting the U.S.A.A.F. on three occasions and R.A.F. bombers on three occasions, aeroplanes of Fighter Command attacked railways and other objectives in France, Holland and Belgium on eight days. R.A.F. fighters of Army Co-operation Command attacked Occupied Europe on nine days. Attacks on shipping in the North Sea were made by Fighter Command on seven days and by Coastal Command on three days and two nights. Enemy aircraft were over this country on four nights and 21 days during October.

In the Middle East the R.A.F. maintained day and night offensive action throughout the month and on Oct. 24 light bomber, fighter-bomber and fighter sorties broke all their previous records. Attacks on shipping carrying supplies to Tobruk and Benghazi were reported on 16 days. The period from Oct. 10 to Oct. 26 is said to have been one of the most momentous in the history of Malta. During that time 138 enemy aeroplanes were destroyed, 131 by R.A.F. pilots. Between Oct. 11 and 18, 1,400 enemy sorties were flown against the Island and 114 aeroplanes were destroyed. R.A.F. losses were 27 Spitfires, of which the pilots of 14 were saved.

In all offensive operations over N. Europe the R.A.F. destroyed 14 enemy aeroplanes and 21 were shot down over Great Britain, making a total of 35 destroyed during October. R.A.F. losses over Europe were 110 aeroplanes, and three were lost over Great Britain. In the Middle East theatre of war, including Malta, the R.A.F. lost 129 aeroplanes and the Axis 286.

The production of Australian-built Bristol Beauforts in October broke all records according to a statement made by Mr. D. Cameron, Australian Minister of Aircraft Production, on Nov. 3.

A four-motor bomber carrying 32 people crashed at Gibraltar on its way from Malta on Oct. 31. The machine was said to have struck a rocky pinnacle and to have crashed into the sea. The crash was announced from Ottawa on Nov. 2. Pilot Officer G. F. Beurling, D.S.O., D.F.C., D.F.M. and Bar, a Canadian, and one of the best known fighter pilots at Malta, was said to have been on his way back to Canada and to have been injured in the crash. Fifteen of the other occupants of the bomber were reported killed and eleven missing.

The Ford Motor Company at Detroit was reported on Oct. 30 to be planning to build gliders of a type capable of carrying 15 fully equipped soldiers for invasion purposes.

An employee at an aircraft factory in the North-West, Frank Salt, was sentenced to three years' penal servitude on Nov. 2 for failing to tighten a vital nut on aero-motors. Of 81 aero-motors examined in the factory, 19 had a slack nut for which Salt was responsible.

A Supermarine Walrus of the Air-Sea Rescue Service alighted on the sea in the middle of a German minefield on Oct. 31 to rescue the pilot of a Whirlwind of Fighter Command who had had to bale out a few miles from the French coast. The pilot of the Walrus said he had to alight across wind to avoid the mines and when taking off had to bounce the Walrus over a mine.

A unit of the R.A.A.F., under the command of Wing Commander Grant Moore Lindeman, D.F.C., was stated on Nov. 2 by Mr. A. S. Drakeford, Australian Air Minister, to be based in Russia and helping to protect convoys to Murmansk. Australians in a Catalina squadron were also said to have been operating from Russian bases.

Nearly 62,000 cadets of the A.T.C. have been given flights during the Summer at A.T.C. camps. Many of the pilots were men "resting" after a period of operational duties. There are now 14 A.T.C. gliding schools and the number of A.T.C. cadets is said to total almost 250,000.

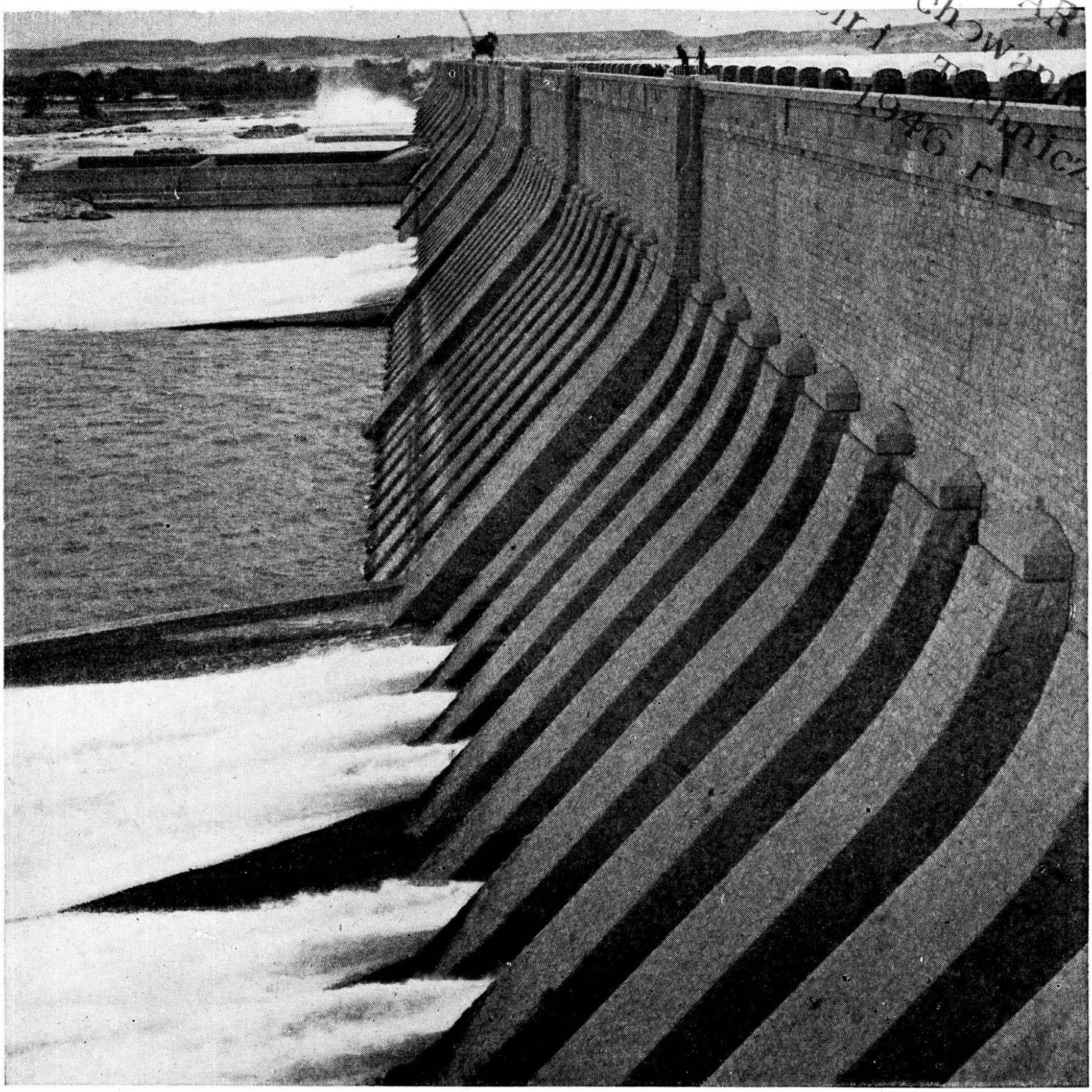
A cheque for £5,281 has been sent from the R.A.F. in the Middle East to Malta as a tribute to the people of Malta.

Air Vice-Marshal J. E. A. Baldwin, recently appointed Deputy A.O.C.-in-C., India, has been promoted to the rank of acting Air Marshal.

Members of the W.A.A.F. are entirely responsible for gas defence at a Fighter Station of the R.A.F., according to an Air Ministry statement on Nov. 5. Gas squads are formed by members of the W.A.A.F. from most sections.

A one-man inflatable lifeboat weighing 12 lb. has been developed by the United States Rubber Company, working with basic British designs. The lifeboat can be inflated in five to ten seconds and when inflated measures 5 ft. 6 in. by 3 ft. 4 in. It carries reinforced fabric paddles, repair plugs, a bailing cup, sea anchor and a hand pump among its equipment.

The report that 40 Turkish airmen had been sent to Germany to train with the Luftwaffe, which was published in THE AEROPLANE of Aug. 7 last, was incorrect The information accompanied news of the arrival in Great Britain of 40 Turkish pilots for a course with the R.A.F. and was accepted in good faith. We are now informed that no Turkish airmen have been sent to Germany.



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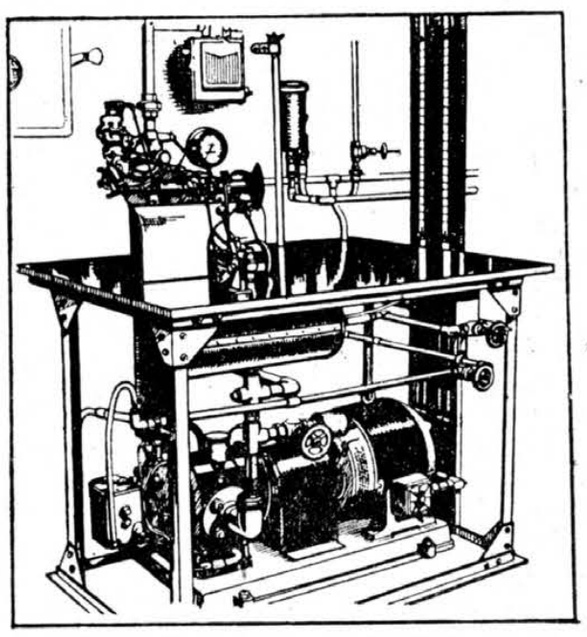
Outstanding achievements in control are represented on the one hand by the mighty Assuan Dam, which controls the flow of water in the lower reaches of the Nile, thereby rendering countless acres of otherwise arid land fertile, and on the other by the Rolls-Royce Boost Control unit, which relieves the pilot of responsibility in controlling to a safe limit the great potential power of all Rolls-Royce aero engines.

On this device, as on all other components of the Rolls-Royce engine, constant development proceeds to ensure that it is as near perfection as human ingenuity can attain.



AUTOMATIC BOOST CONTROL TEST RIG

ROLLS-ROYCE

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A. A counter-rotating six-bladed propeller is a very efficient means of producing a large blade area, by the use of which high powers may be handled even at great altitudes, without going to excessive diameters, or even to such high r.p.m. that compressibility losses become serious.

Compared with a six-blader of conventional design the counter-rotater has the following advantages :

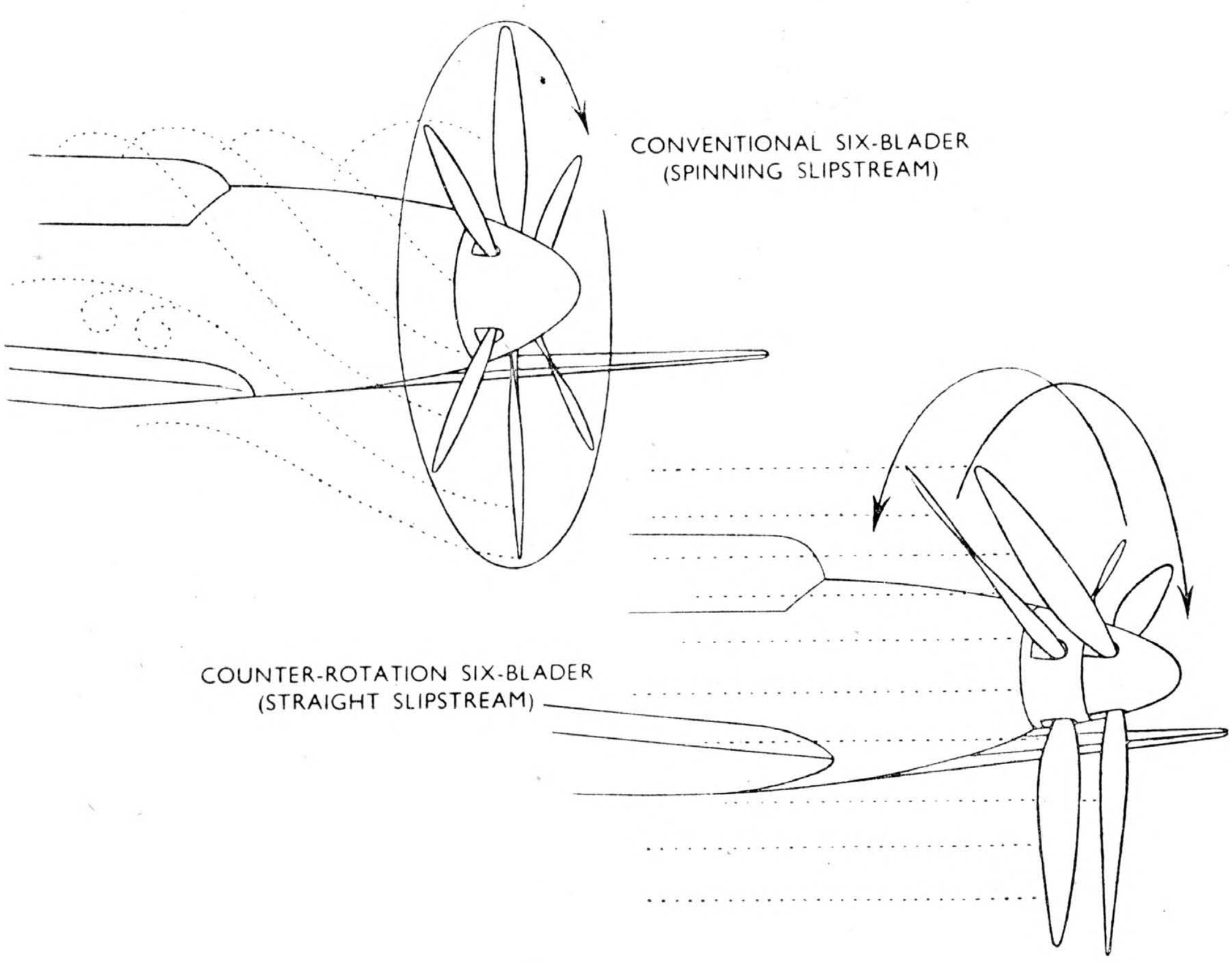
(a) The interference between the blades is less serious, and from some aspects is even favourable ; in particular, high take-off thrust is obtained because of this.

(b) The spinning slipstream of the single propeller is avoided, resulting in the cancellation of torque reaction, with improved efficiency. Also, the consequent improved flow over the aircraft itself is an advantage.

(c) Gyroscopic moments are eliminated.

(d) Its hub is less bulky.

Against these advantages, of course, the counter-rotating propeller needs a special reduction gear to provide the contra-rotation feature, but this is a price worth paying for these large gains in performance.



This is one of a series of articles on technicalities sponsored by The de Havilland Aircraft Co., Ltd., in the belief that they will prove of interest and use to students and others in the Services and the aircraft industry.

The Aeroplane
Nov. 13, 1942

WINGS ARE THE WHEELS OF TO-MORROW

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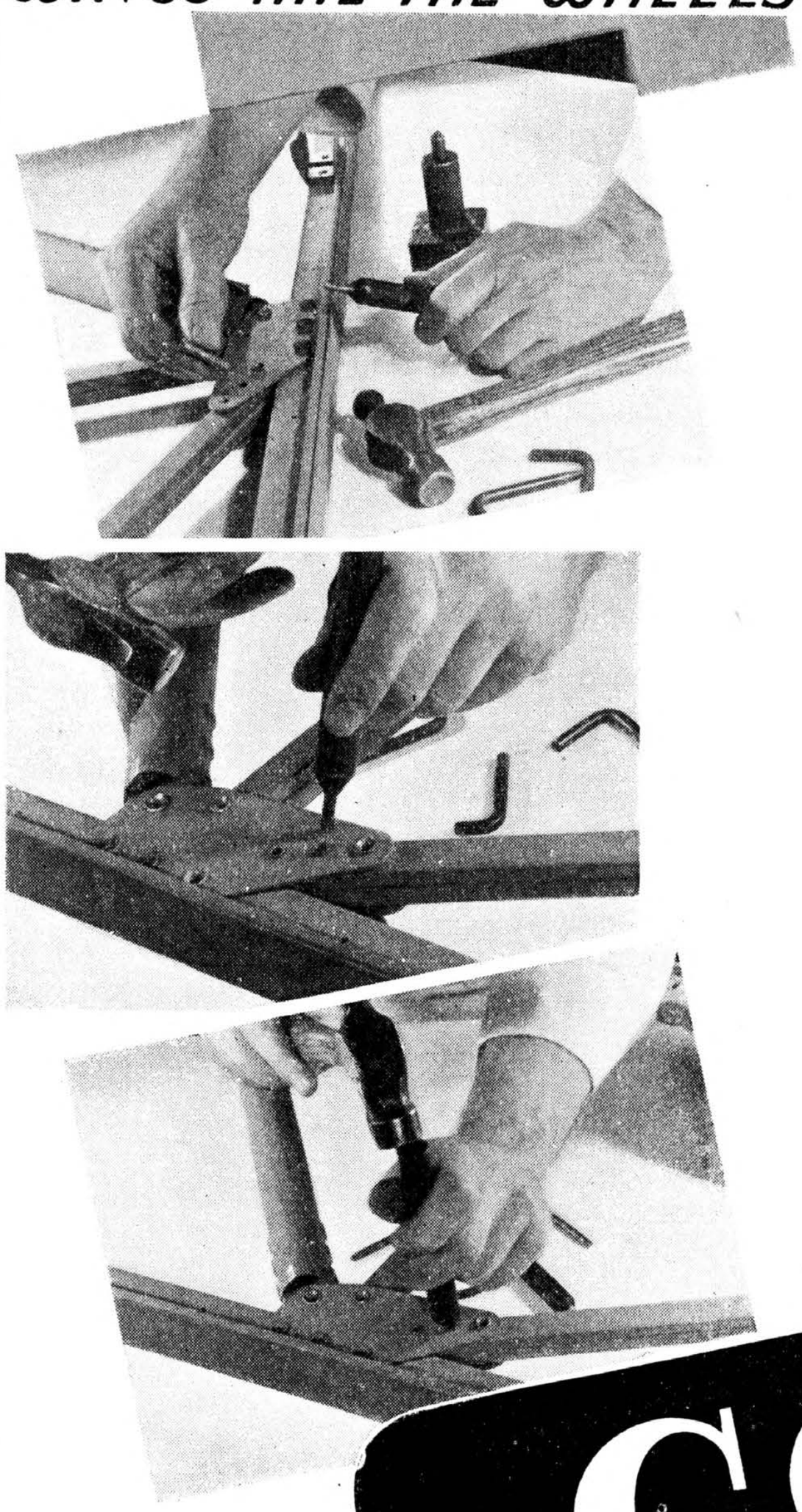

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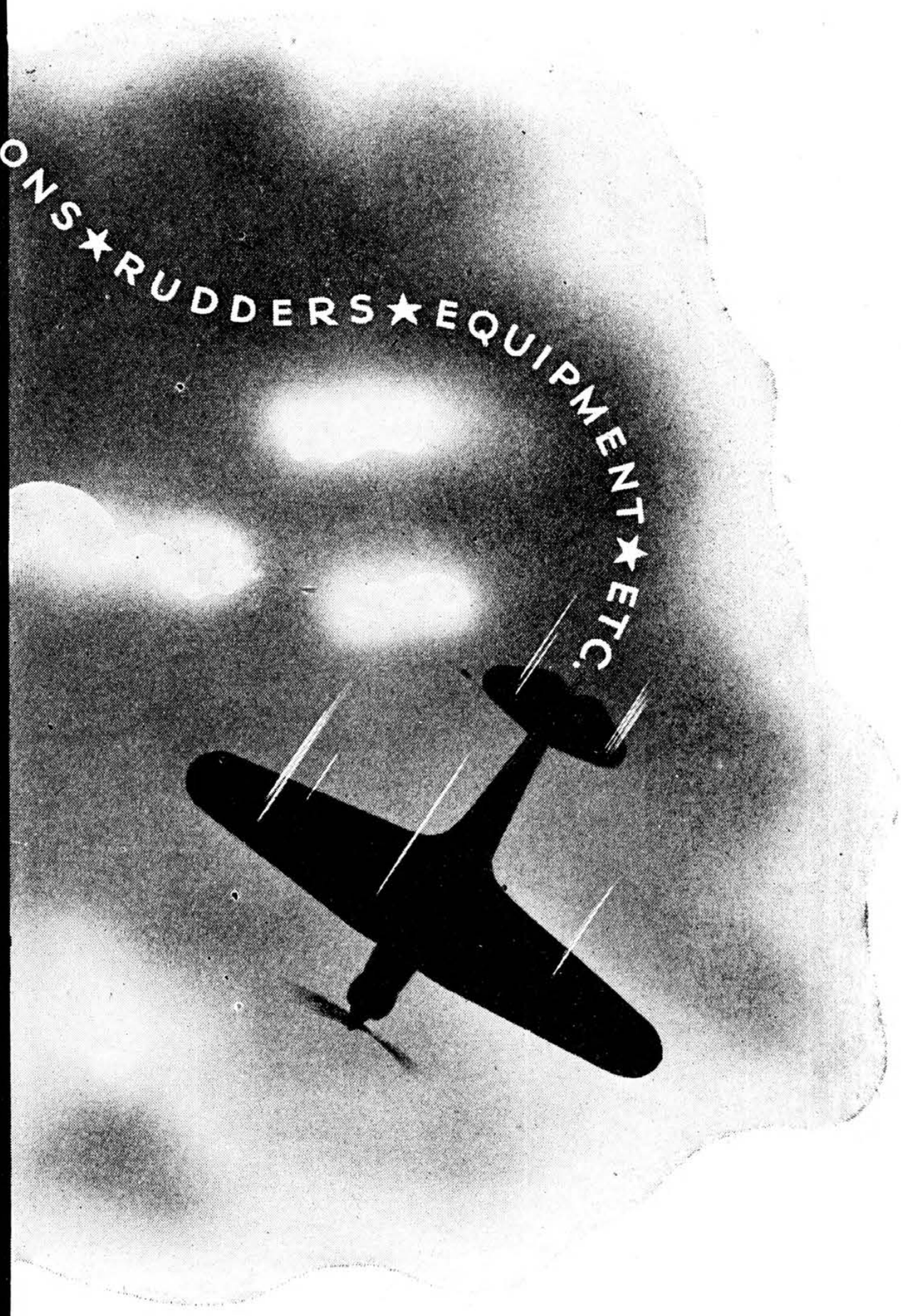


MORRISONS

CROYDON

IT is recorded that a somewhat primitive form of the sea chart as we know it to-day was first brought to England in 1489 by Bartholomew Columbus, to illustrate his more famous brother's theory respecting a Western Continent. Adventurous and painstaking men since that time have added to our store of knowledge of coast line and ocean bed, so that to-day there is no corner of the seven seas normally visited by man which is not accurately and comprehensively charted. The makers of modern service craft, too though ever mindful of the traditions of the sea, are by their enterprise and craftsmanship constantly exploring hitherto uncharted channels of development.

THE BRITISH POWER BOAT COMPANY LTD.

Constructors of Scott-Paine Surface Craft

Plt. Offs. (prob.) confmd. in appts. May and to be Flg. Offs. (war subs.:—Aug.: C. O. Bird, C. H. Duringer, N. J. Searle, W. Wilson.

Plt. Offs. (prob.) confmd. in appts. June and to be Flg. Offs. (war subs.):—Aug.: B. G. Clouston, A. A. Gray.

Plt. Off. (prob.) E. G. W. Hann confmd. in appt. June and to be Flg. Off. (war subs.). Aug.

MEDICAL BRANCH.—Flg. Offs. (war subs.) to be Flt. Lts. (war subs.):—June: J. R. Acfield, M.B., Ch.B. Aug.: T. G. Band, M.B., Ch.B.; T. B. Binns, L.R.C.P.S., L.R.F.P.S., L.D.S.; G. M. Wilson, M.B., Ch.B.; J. R. Hughes, M.B., Ch.B.; G. R. Ferguson, M.B., Ch.B.; F J. Hallinan, M.B., B.Ch.; T. N. N. Brennan, M.B. B.Ch.; T. K. Haran, L.R.C.P.S., L.M.; E. D. Arkell, M.R.C.S., L.R.C.P.; T. A. Hale-Monro, M.R.C.S., L.R.C.P. Sept.: K. W. B. Rostron, M.B., B.Ch.

DENTAL BRANCH.—Flg. Offs. to be Flt. Lts. (war subs.):—July: J. Ireland, L.D.S. Aug.: C. McF. Brown, L.D.S.; P. Crabtree, L.D.S.; J. R. Prior, L.D.S.; R. H. Hancock, L.D.S.; J. C. O. Hurst, L.D.S.; H. Clarke, B.D.S.; R. J. Gethin, B.D.S.; D. E. Skidmore, L.D.S.; K. A. Stanyor-Jacques, L.D.S.; K. J. Cawley, L.D.S.; A. Amdor, L.D.S.; J. N. Civil, B.D.S.; A. C. MacLeod, L.D.S.; A. E. Perkins, L.D.S.; C. C. B. Plumley, B.D.S.; C. A. Price, L.D.S.

ROYAL AIR FORCE REGIMENT

Plt. Off. (prob.) W. Heath confmd. in appt. May and to be Flg. Off. (war subs.) May (Sen. Apr. 17.)

Plt. Off. (prob.) F. Briggs confmd. in appt. and to be Flg. Off. (war subs.) July.

Plt. Off. (prob.) N. G. Foulkes confmd. in appt. June and to be Flg. Off. (war subs.) Aug. (Sen. July 7.)

Plt. Offs. (prob.) confmd. in appts. June and to be Flg. Offs. (war subs.):—Aug.: A. Dawbarn, J. T. Newington (Sen. Apr. 22), A. N. Clint (Sen. July 20), W. R. Bennewith (Sen. July 22), R. Bishop, J. Kennedy, R. H. Squire, H. J. White (Sen. July 27), N. Ackary, A. E. Boyd, S. T. Edwards, L. G. Hearley, S. W. H. Ingham, C. A. Pickett (Sen. July 28).

Plt. Off. (prob.) R. H. Bond confmd. in appt. June and to be Flg. Off. (war subs.). Aug.

Plt. Off. (prob.) G. B. Gouldsmith confmd. in appt. June, and to be Flg. Off. (war subs.) Aug.

AUXILIARY AIR FORCE

GENERAL DUTIES BRANCH.—Wg. Cdrs. (temp.) granted the rank of Sqn. Ldr. (war subs.). Sept.: Sir A. P. Hope, Bt., D.F.C., G. O. Budd, D.F.C., S. G. Beaumont, C. D. Griffiths, D.F.C., G. G. Stockdale.

TECHNICAL BRANCH.—Wg. Cdr. (temp) R. A. Clay granted the rank of Sqn. Ldr. (war subs.), Sept., 1942.

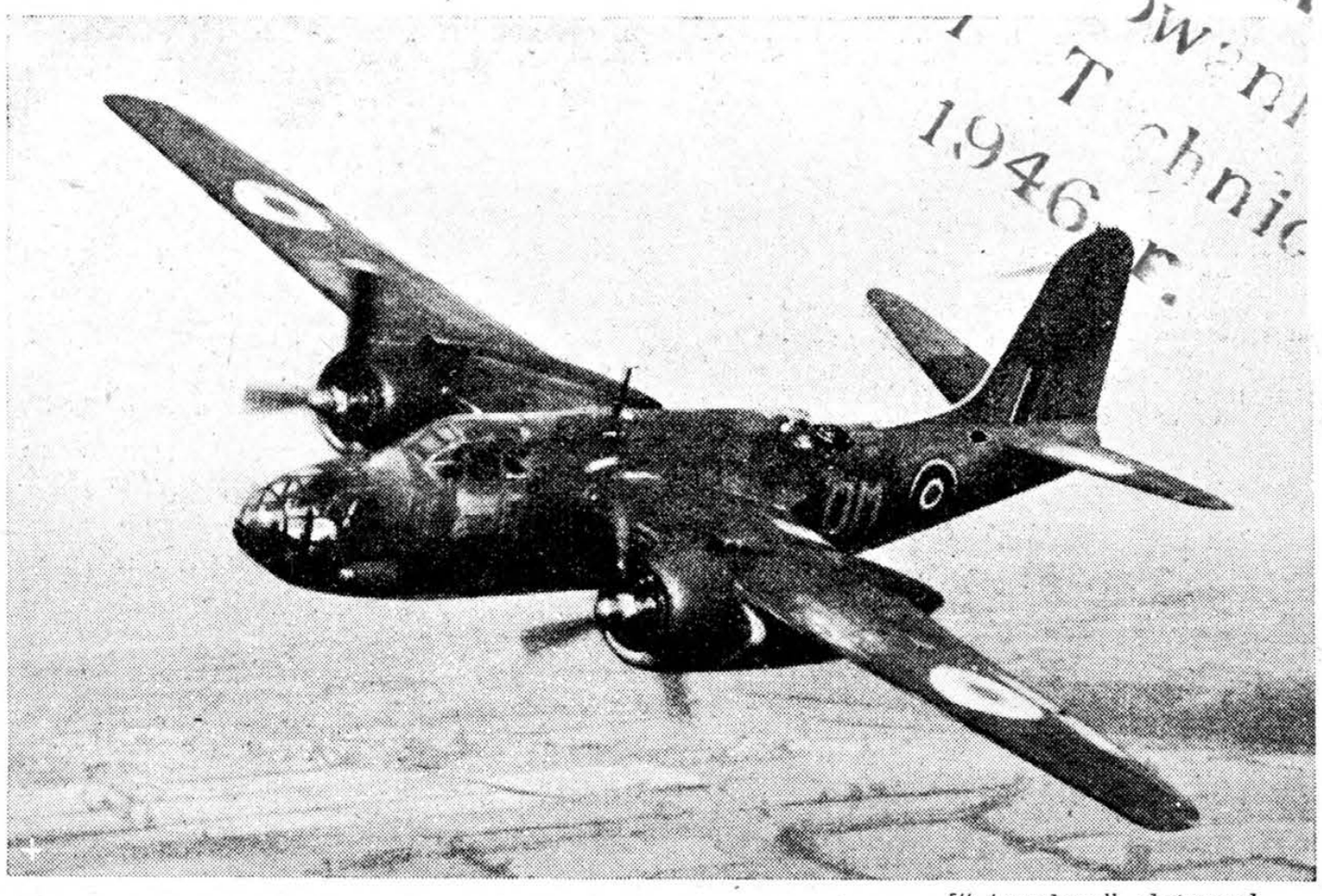
AUXILIARY AIR FORCE RESERVE OF OFFICERS

GENERAL DUTIES BRANCH.—Wg. Cdr. (temp.) P. D. O. Vaux granted the rank of Sqn. Ldr. (war subs.). Sept.

WOMEN'S AUXILIARY AIR FORCE

Asst. Sec. Offs. to be Sec. Offs. (war subs.):—July: C. V. Wilde, M. Y. Amberton, E. D. Disney-Roebuck, S. K. A. Uthwatt, R. Casson, C. M. Moor, K. Butterworth, H. P. Atwood, V. Burleigh, J. F. Hills, H. D. Jobson, J. Freeman, E. B. Morton, J. E. Nicholson, P. M. Spratt, H. Graham, B. I. Thompson, A. J. H. Workman, M. E. Anstruther, S. Bergerson, P. Buss, K. E. Butler, M. K. Cameron, M. S. Rothermann, A. Christie, S. M. Kirk, J. A. MacLachlan, C. W. Norwood, M. Sanders, D. W. Swift, U. M. Taylor, M. E. Williamson, A. Wilson, W. F. Ainslie, M. J. Beattie, P. S. Curry, I. Davis, B. M. Dowding, M. H. Duncan, M. S. Filgate, P. Hallsmith, P. Hathway Jones, S. D. E. Kettlewell, H. A. M. Matthews, E. B. Milln, G. Arengo-Jones, M. Wiltshire, P. A. H. Stiles, E. H. Ayton, J. S. Dowse, N. D. Wilson, N. M. Barnett, M. A. Casey, M. Caudwell, S. M. Skinner, N. U. C. Davis, P. M. Evershed, C. Fyfe, M. S. Goldsbrough, M. M. Graham, D. J. C. Nash, M. L. Willis, F. M. A. Pierce, K. M. Jones, A. J. Coombe, M. Chawner, R. M. Chisholm, R. M. Blanc, E. Tate, D. P. L. Dare, M. J. Everard, B. K. Forbes, M. de V. Galloway, K. M. Lawley, J. H. Collins, H. I. Macrae, M. I. Milne, M. J. Moore, M. S. Neven-Spence, P. M. Norcock, N. M. E. Sims, K. H. Whitehead, W. G. Baker, N. E. Barrett, J. M. Boole, E. P. Campani, P. H. Charles, J. Flower, P. S. Donisthorpe, M. McT. Duncan, Y. H. B. Hartford, T. A. M. Hipkins, B. M. Lambert, M. S. McKeachie, M. D. Marshall, N. S. Rich, F. M. Slessor, A. A. Stevenson, H. M. Gordon, M. B. Vancourt, M. Cardus, S. Cookson, R. I. Cryer, J. H. Donald, F. B. Hearth, F. M. Hopkins, V. D. Howe, E. J. Huntley, R. B. Im Thurn, D. Atherton, J. M. Payn, T. A. Pirie, I. M. Reade, J. Reid, P. J. Shedden, W. Cartwright, P. G. Blockley, E. R. Chadwick, D. M. Charlton, D. F. A. Cuming, D. Deall, J. M. Edwards, A. Ellis, J. M. Fawcett, J. Hancock, V. M. Hough, B. E. James, M. Lea-Wilson, M. Lindsay, P. A. N. MacMahon, M. C. McWatters, M. W. Musselwhite, E. B. Reid, F. L. D. Pawson, K. F. Stevenson, O. Sutherland, M. Swinburne, M. L. Watkins, J. Willoughby-Osborne, P. Clive, E. C. Towse, G. O. Lee, B. M. Apthorpe, J. M. Brown, E. M. Burren, J. Cooke, M. J. Disbrowe, M. I. MacKenzie, M. D. Gardner, N. Gilbertson, J. M. M. Graham, M. Harris, D. M. Cramp, J. M. I. MacDonald, E. S. Hunter, F. S. Leek, A. Lambert, E. D. Lyne, M. F. A. Mount, S. M. Newman, C. M. Price, M. E. Ralphs, E. M. Reeves, I. L. M. Stevenson, P. Boxer, M. D. E. Ten Broeke, G. M. Walkden, D. Strong, M. Whitehurst, S. L. R. Wotherspoon, M. Z. Pain, E. M. Aves, P. M. Braithwaite, G. E. Buffey, E. M. W. Crocker, B. Davies, E. P. Davies, P. M. S. Davis, L. G. Dick, G. Dunlop, G. B. Dunstone, E. D. Durling, E. A. Ferrie, J. M. Fraser, D. F. Stewart, M. B. Goodman, G. A. Hide, E. M. S. Hughes, D. H. McFarlan, F. E. G. MacGregor, E. C. G. Miller, V. P. Mortimer, E. B. Sara, J. M. Sowerby, I. M. Stannard, A. W. Taylor, M. Truter, S. D. Workman, F. M. Bemrose, D. G. Brodie Thomas, M. H. J. Millar, V. M. Carter, E. M. Corkill, J. H. Craw, V. Gwynne-James, S. MacG. Nettleton, G. Henderson-Howe, J. E. Marks, A. R. Middleton, A. L. Power, A. R. Simpson, D. F. Smith, J. Standeven, J. J. Watkins, M. J. Perkins, A. E. Wheeler, J. A. G Austin, J. D. A. Barnett, E. Claridge, C. A. Clayton-East, B. U. Darlow, J. L. Draper, E. Hill, R. E. Howard. B. M. Larkin, E. H. Lonsdale, M. R. Maude, D. P. Seccombe, G. M. Shadbolt, D. Frost, M. E. Joy, P. M. Townson, M. T. Turner, P. M. S. Bilton, J. A. Bouquet, H. F. E. Allison, M. H. Brash-Grant, J. I. Burroughs, M. H. Brown, M. M. Burns, J. G. Cutting, M. Crawford-Smith, D. A. Fowle, A. C. Francis, M. E. Tucker, L. M. Jackson, B. R. Killick, M. A. McG. King, A. C. Love, M. F. Rose, J. M. Mauldin, J. W. Silvester, D. C. M. Stott, E. M. Thompson, J. B. Walker, R. C. Williams, C. R. Andrew, H. Avery, M. H. Gibson, J. M. Hawes, P. E. Hind, E. M. B. Hoy, R. Jensen, O. Kay, M. J. Manning, V. Crew, R. Metcalfe, M. Platt, D. M. Poole, E. A. Stedman, A. L. Tod, E. M. Townsend, H. C. N. Turnbull, L. M. Williamson, M. W. Willis, E. M. Robertson, B. J. Hancock, E. M. Birch, M. A. Buss .S. M. P. Coggins, F M. Dearlove, L. E. Faulkner, M. W. Fuller, D. F. Goodwin, P. G. Stannard. L. W. Bramwell Davis, M. L. Buxton, E. M. Johnson, A. M. H. Joshua, K. A. Lepper, P. E. Massey, E. M. Olney, M. H. Russell, M. P. Sutton, D. Tanqueray-Willaume, F. M. Taylor, D. V. D. Underwood, A. B. Wilson, M. Beadon, A. L. Briggs, D. L. Carmichael, M. E. Coppleston, D. M. Dunbar, K. Gordon, O. G. Hargreaves, P. Ward, E. Hockey, A. J. Howorth, I. L. M. Innes, H. M. Lyster, J. C. Mercer, P. J. Nugent, Lady, G. C. Richards, M. E. P. Robertson, J. Rose, B. J. Rowden, H. Smith, B. C. Turier, L. F. E Wall.

Air Ministry, October 6, 1942.



["*Aeroplane*" *photograph*

A WELL-ARMED BOMBER.—A Boston III bomber which carries 2,000 lb. of bombs and seven machine-guns.

ROYAL AIR FORCE

GENERAL DUTIES BRANCH.—To be Plt. Offs. on prob. (emergency):—Wt. Offs.: May: Leonard Cottingham, D.F.C. July: James Cowley, J. A. C. Kite, Merlyn Williams, John Day, E. A. Fletcher, W. H. Kellaway. Aug.: J. H. Thain. Temp. Wt. Offs.: May: G. R. Watkins, Frederick Ellison. Flt. Sgts.: C. W. Stacey July: Hugh Cameron, P. W. Digby, A. E. C. Wilkie, Bernard Southall. Aug.: J. W. Moore, W. S. Dossett, J. J. Mullineaux, D.F.M. Sgts.: July: A. E. E Cole, W. F. Young. Aug.: J. R. Williams

Air Cdre. M B. Frew, D.S.O., M.C., A.F.C. to be Act. Air Vice-Mshl. Sept. 16.

Plt. Off. (prob.) D. H. Sinclair is transf. to the Admin. and Spec. Duties Br. Sept.

Flt. Lt. G. H Russell, D.F.C., is dismissed the Service by sentence of General Court Martial. Aug.

MEDICAL BRANCH.—Wt. Off. C. V. Frost to be Flg. Off. (Qr.-Mr.) on prob. (emergency). July. (Sen June 11.)

ROYAL AIR FORCE REGIMENT.—Wt. Off. F. C. Peart to be Flg. Off. on prob. (emergency). Aug. (Sen. June 1.)

To be Plt. Offs. on prob. (emergency):—Wt. Off: Aug.: J. V Desemonie. Flt. Sgts.: J. S. Milton, V. S. Baker, M. J. Craigs, J W Walkington. Sgts.: Herbert Sullivan, John Hargreaves, F. G. Worthington. Cpl.: Harold Warburton (Sen. June 1).

RESERVE OF AIR FORCE OFFICERS

GENERAL DUTIES BRANCH.—Sqn. Ldr. A. W. Heward is seconded for special duty. May.

ADMINISTRATIVE AND SPECIAL DUTIES BRANCH.—A. E. G. Collins, M.C., to be Gp. Capt. in class CC. July.

To be Sqn. Ldrs. in class CC:—July: W. J. H. Cooke, Stanley Ridgway.

To be Flt. Lts. in class CC:—July: C. A. Bacon, N. C. Davies, J. S. Garment, R. H. S. Hunter, H. L Jackson, L. K. Kaines, F. D. Wemyss.

P. M. De La Coze to be Flg Off. in class CC. July.

ROYAL AIR FORCE REGIMENT.—Flt. Lt. P. F. Murch is transf. to the Admin. and Spec. Duties Br. Sept.

ROYAL AIR FORCE VOLUNTEER RESERVE

GENERAL DUTIES BRANCH.—To be Plt. Offs. (emergency):—June: E. R. Hill. Aug.: P. MacK Badenoch, A. J. B. Baily, G. W. H. Byres, G. C. Crew, O. P. Faraday, Peter Geldart, R. D Gummer, K. A. Sidford, L. W. H. Stevens, R. I. D. Tetley, T. C. Wood.

To be Plt. Offs. on prob. (emergency):—Aug.: Robert Duncanson. Wt. Offs.: June: Leonard Smith. July: J. K. Norwell, R. L. Smith, D.F.M. Aug.: James Battersby, B.E.M. Temp. Wt. Offs.: May: John Halifax. July: D. A. Easton, F. O. Waddington, D.F.M. Flt. Sgts.: May: Frederick Carter. June: J. R. Boiston, D. J. Whalley, A. R. Poole D. R. Harborow. July: Robert Armstrong, D.F.M., William Bold, J. N. B. Rounce, E. W. R. Oranmore-Copland, T. R. Prescott, D. A. Carmichael, A. H. Warminger, J. W. Woolfries, L. R. Fears, G. S. Bennett, F. T. Heden, S. H. Carder, H. M. Morton, J. G. Chapman, K. L. Storey, A. P. Mountain, D.F.M., Gerald Tate. Aug.: E. G. Willis, C. J. Taylor, Harry Rankine, N. T. Lawrence, L. H. Allen, R. L. Butt, R. E. Parsons D.F.M. Sept.: I. S. Currie. Temp. Flt. Sgts.: June: A. J. Hawken, P. J. N. Stancliffe, L. N. Smith, D. H. Fenton. July: A. H. Battersby, H. A. Aitken, W. A. Thynne, M.M., B.E.M., P. W. Hewitt. Sgts.: June, 1941: Frederick Jenkins. Sept., 1941: D. H. Thomas, W. D. Lister. Oct., 1941: J. A. S. Banting. Nov., 1941: J. A. Glover, R. C. Hawson, G. E. Pearse, C. F. Strutt. Jan.: Richard Clowes. Feb.: Kenneth Burrell, J. G. Young. Mar.: Frederick Aiston. Apr.: P. D. Mackie, P. E. Rapson, R. O. Burgess, A. H. Smith, Sammy Birch, G. E. Dury, J. G. Enticott, F. L. Devaney, E. M. Stanyon. May: J. H. Richards, K. I. Eades, P. N. Farlow, A. E. Harkness, G. A. Jeffcott, H. A. Horden, V. M. Sparkes, P. M. McConnell, Charles Berry, F. E. Hixon, J. H. Tremear. June: T. W. Beckett, C. P. Ellis, William Forbes, W. B. Lucas, J. H. Maxwell, W. H. McDowell, R. B. Capon, P. T. Howson, L. V. Armstrong, Tom Grace, W. J. A. Wilson, A. T. Tinker, R. H. Green, Edward Beale, E. G. E. Parry, M. A. Berkeley, Richard Lund, Eric Walton, A. S. Pedley, E. E. Mackay, E. B. Churchill, R. C. Hooper, R. A. M. Lemmon, J. K. Shaw, J. R. Keohane, R. H. McGregor, Peter Milner, W. T. Norman, R. H. Redshaw, H. G. Slade, William Young, S. G. Falconer, R. J. Dunford, C. S. V. Page, I. F. Stamper, P. L. Tebbit, A. D. Baxter, J. J. K. Burr, Harry Enever, L. W. Gill, W. A. Hickman, K. M. Holroyde, H. L. Martin, R. W. Picton, J. B. R. Ellis, Robert Watson, James Gilmour. July: C. W. J. Fearn, William Bertram, K. J. Batt, D. E. Banks, William Banks, W. T. Barrett, Cyril Edwards, K. W. Fleming, B. J. Goodhew, Robert Hellier, A. W. Hitchcock, Ronald Hothersall, P. A. C. Hunt, G. E. Mann, A. S. Smith, E. H. Farrar, John Tomalin, T. E. Unwin, P. C. Love, J. H. Mair, V. P. Upton, A. J. Ward, K. H. Windmill, W. McK. Hodgson, E. A. Gee, Bruce Hamilton, R. N. Paul, W. S. Dixon, Jack Hepworth, G. N. F. Robinson, Peter Booth, D. J. Jones, Gerald Lockley, A. J. Bradley, H. E. W. Taylor, H. C. Graham, D. J. Hollies, E. R. Bridges, J. A. Inglis, T. A. Perry, H. E. Jones, M. H. M. Stahl, B. K. Blachford, L. D. Dunnett, E. S. Robertson, D. C. Savage, Neiton Pilpel, G. N. Sutton, D. L. F. Hoare, William Rowan, R. H. Smith, Thomas Scott, P. O. Lankester, R. J. Atkins, V. J. Bell, D. F. A. Welsh, R. A. Milne, A. J. Padwick, F. W Newton, L. F. Green, P. J. Hearne, Maurice Andrews, A. R. B. Ball, G. A. Dobson, Reginald Fletcher, J. D. Marquis, Desmond Curtis, P. N. Dix, J. R. Binks, J. C. Day, J. E. Foster, H. J Franklin, Alwyne Marriott, K. G. Till, W E G. Churcher, P. R. White, M. J Gubbins, L. T. Mersham, F. C. Collis. Aug.: A. N L. McQueen, G. E. Robertson, W. A. G. Gallienne, Alexander Sutherland, A. E. Oldham, M. W. Dale, J. B. Miller, W. W. Aldridge, H. M. Perry, Mackenzie

Ross, C. A. Rowland, J. H. Wright, H. E. V. Budge, J. G. Cottam, D. H. Darney, H. W. Haxton, E. S. Hazelton, L. C. J. Martin, A. J. Horobin, G. H. Willis, W. T. Hinds, H. McF. Dodd, A. H. Heath, J. L. Spence, R. C. Arthur, A. G. B. Bennett, A. E. Cooper, F. J. French, D. T. P. O'D. McGlory, J. T. Matthews, G. A. Phipps, L A. Seary, A. E. Stocker, G. H. Turner, E. W. Bennee, L. C. Martin. Temp. Sgt.: July: R. L. Wilson. Cpls.: Jan.: D. C. Byrne. July: Bernard Soulsby. Act. Cpl.: G. S. Linton. Ldg. Acm.: Dec 1941: J. R. Byles. Mar.: G. E. Beswick. Apr.: E. B. Blackburn, D. D. Carrow, N. F. Bomford. May: R. V. Dawes, R. C. Farrant, Denis Morant, D. B. Pendlebury, A. L. Saunders. June: M G. Keys, S. R. Cooke, S. E. C. Clark, J. G Sandiford, D. A. Wintle, R. D. Fearns, Edric Bibby, J. E. Keech, D. S. V. Rake, C. R. Leitch, W. M. Greenwood, W. L. Merryfield, A. F. Minnis, M. F. Baxter. July: W. K. Lewis, Stanley McCreith, F. R. S.-T. Mitchell, W. J. Mowatt, J. B. J. Smith, N. F. Snelson, R. E. Reynolds, George Sawle, R. R. Farrell, John McNaucht, S J. Perkins, G. T. Pyke, R. D. Stebbings, S. C. Izod, K. W. Emberson, D. R. Hatton, M. V. Wareing, J. T. Clarke, Richard MacFarlane, A. E. Whittaker, T. L. Noon, K. H. Loder, R. J. J. Howley, L. S. Ajrekar, N. W. B. Mould, R. W. Niven, F. W. Gates, V. C. Sherring, Bryan Dunn, L. J. Dowdall. Aug.: R. L. Barnes, R. H. M. Bailey, Andrew Birks, J. A. M. Forbes, E. R. Curtis, George Jarvis, J. S Ambler, M. J. Brogan, W. J. Edwards, J. W. Haggas, C. T. Reid, L. E. Richards, A. J. Thrower, R. T. Boyce, E. R. Lewin, L. G. Evans. Sept.: H. T. Etienne, R. J. Gritten, S. W. Peglar, P. F. McDermott, C. J. Wilson.

Flg. Offs. to be transf. to the Admin. and Spec. Duties Br :—Sept.: R. F. Cambridge, J. Beard.

Plt. Off. M. Graham takes rank and precedence as if his appt. as Plt. Off. bore date Dec. 23, 1941. Reduction from Sept. 4, 1941.

Plt. Off. S. V. Andrews relinquishes his commn. on account of ill-health. Sept. 8.

Plt. Off. R. R. Reed is cashiered by sentence of General Court Martial. Sept. 21.

In notifn. of July 21, concern. A. J. Mackenzie, for Mar. 4, 1942, read Dec. 23, 1941.

In notifn. of Aug. 25 concern. Plt. Off. C. K. Ouin, for Aug 9 read Aug. 7.

In notifn. of Sept. 8 concern. J. A. Parson, for Parson read Parsons.

TECHNICAL BRANCH.—Act. Plt. Off. (prob.) T. W. B. Lambert is transf. to the Admin. and Spec .Duties Br. and graded as Plt. Off. (prob.). Aug. 11.

Act. Plt. Off. (prob.) S. Foster relinquishes his commn. on account of ill-health. Sept. 15.

Act. Plt. Off (prob.) A. Hyde resigns his commn. Aug. 1

BALLOON BRANCH.—Flg. Off. B. Moores relinquishes his rank at his own request and is transf. to the Gen. Duties Br. in the rank of Plt. Off. Sept. 17.

To be transf. to the Admin. and Spec. Duties Br. Sept.: Flt. Lt.: C. F. Fowler. Flg. Offs.: A. C. Annand, J. L. Crook, S. E. Lingwood, A. Scott.

ADMINISTRATIVE AND SPECIAL DUTIES BRANCH.—S. W. Poore to be Act. Plt. Off. on prob. (emergency). Sept.

Flg. Off. G. F. Orr relinquishes his rank at his own request and is transf. to the Gen. Duties Br. in the rank of Plt. Off. Sept.

Flg. Off. J. L. Hayward relinquishes his commn. on account of ill-health and retains the rank of Flt. Lt. Sept.

Flg. Off. L. G. Pitt-Moore relinquishes his commn. on account of ill-health and retains his rank. Sept. 17.

Plt. Off (prob.) H. Rawlings relinquishes his commn. on ceasing to be employed. Oct. 1.

Flg. Off. J. R. Cobb resigns his commn. and retains the rank of Sqn. Ldr. Sept. 23.

Flg. Off. R. J. G. Boothby, M.P., resigns his commn. and retains the rank of Flt. Lt. Sept. 23.

AMENDMENT.—In notifn. of Sept. 8, for Baglesham read Eaglesham.

TRAINING BRANCH.—Act. Plt. Offs. resign their commns.:—Sept. 16: J. M. Aldridge, A. W. Brogden, J. M. Button, S. F. Croxford, J. M. Southward, G. A. Taylor, A. R. Thomas.

EQUIPMENT BRANCH.—To be transf. to the Admin. and Spec. Duties Br.:—Sept.: Sqn. Ldrs.: J. Salmon, W. A. Steward. Flt. Lt.: N. H. Bennett. Flg. Offs.: A. R. Benbow, P. S. Gooda, J. L. Gore-Sellon, T. F. Griffin, L. T. Gygax, J. E. Kidd, B. H. Miller, W. H. Over, K. Slinsby-Fahn, G. A. Smith, R. J. Smith.

MEDICAL BRANCH.—P. A. Carrie, M.B., Ch.B., to be Flt. Lt. (emergency). Sept.

To be Flg. Offs. (emergency):—Sept.: Eugene Baldacchino, M.D.; C. R. Deuchar, L.M.S.S.A.; F. R. C. Manning, M.R.C.S., L.R.C.P.; E. F. Brown, M.B., Ch.B., M.R.C.S., L.R.C.P.; N. K. Farley, M.B., Ch.B.

CHAPLAINS' BRANCH.—To be Chaplains (emergency) with the relative rank of Sqn. Ldr.:—Aug.: The Rev. N. H. Hurst, B.A., The Rev. E. A. Dentith. Sept.: The Rev. C. E. Heap, B.A., The Rev. R. M. Taylor, The Rev. H. M. Rattenbury. Acm. 2nd. Cl.: Oct., 1941: Joseph Lowe (Sen. Aug. 12, 1941).

ROYAL AIR FORCE REGIMENT.—To be Plt. Offs. on prob. (emergency):—Aug. (Sen. June 1): Wt. Off.: R. H. Johnson. Flt. Sgts. J. H. Holloway, H. T. Law, G. W. Marston. Act. Flt. Sgt.: E. R. W. Gittins. Sgts.: E. T. Baldock, J. V. Barford, J. W. E. Binns, Edwin Brand, Felix Byrne, D. G. Clarke, D. A. Copeman, Arthur Dagleas, T. P. R. Forbes, W. B. Fox, James Jackson, A. L. Lord, K. J. McBride, Frank Newbon, Bernard Newnham, E. B. Raffield, D. P. Rutherford, Ronald Stevens, W. S. Walter, George Wiseman. Cpls.: R. H. Barnes, J. D. Baxter, Harry Bell, C. B. Bullough, A. E. Butler, D. H. Christophers, T. H. Crichton, V. M. Crowshaw, G. G. Darling, G. E. W. Denning, Jack Evans, R. B. Furness, Leonard Galloway, D. E. Gordon, Reginald Griffies, A. L. Harris, S. J. S. Herbert, P. A. L. Hodges, N. H. Holder, J. H. Howell, F. H. Jones, Percy Marshall, C. P. C. Martin, K. C. Orsborn, R. T. Reed, M. B. Reynolds-Graham, E. L. Roberts, J. M. Robinson, F. O. Rowe, J. E. B. Scragg, Clifford Shore, W. F. Sillery, G. M. Simmons, N. C. S. Stace, Joseph Waring, J. T. Weale, Harry Westwoode, Richard Williams, Act. Cpls.: S. W. Hargraves, W. MacK. Kirkpatrick, R. M. W. McKenzie, R. W. J. Merriman. Ldg. Acm.: Hubert Allen, E. F. Archer, G. G. S. Astbury, P. V. Bonfield, P. H. Brice, A. G. Briggs. Charles Browne, John Buckman, C. H. O. Chappell, W. W. R. Clarke, John Cockcroft, J. W. Cole, G. D. E. Crouch, C. W. Dinning, W. E. Duffy, J. A. Gee, S. J. Hayter, B. C. Hill, G. H. E. Hutton, G. R. B. Ingram, R. H. Jackson, H. C. K. Johnson, N. D. Johnson, G. L. de A. Leslie-Carter, W. A. Lockie, James Mason, I. G. Meff, F. J. A. Miles, A. I. Mitchell, F. M. Mullock, B. J. McCall, David McMillan, A. A. Macgregor-Norman, C. F. Parry, E. A. Richardson, B. W. Short, W. D. Smith, A. G. Spiers, L. A. Staig, L. H. Stringer, Michael Tarbet, J. W. Vidler, Norman Vivian, K. E. White, William Wylie. Acm. 1st Cl.: R. H. Balmforth, Robert Beedie, W. C. St. J. Chappell, E. E. Chivers, R. J. Cody, A. J. Davis, Lewis Evington, R. G. Gallard, C. H. Griffiths, A. I. Hart, F. P. Huggins, J A Jackson, R. L. S. Lock, F. E. Longhurst, H. J. Macmillan, Fred Nicholson, K. W. Pearce, Cyril Pearson, L. H. Pennington, S. N. Pugh, I. P. Reed, G. H. Shannon, Stanley Stanley, A. W. Wildman, R. A. D. Young. Acm. 2nd Cl.: P. H. Arnold, D. J. A. Brown, J. R. Burns, J. H. Cordle, A. G. Croft, G. H. Dawson, V. H. Dewey, A. F. Forster, J. A. Gardner, G. W. Gough, William Greensword, H. F. Homer, L. H. Jones, W F. Kellaway, A. C. King, E. W. Legge, M. B. Leigh, N. H. Lever, Basil Lowe, G. F. Meadmore, M. F. H. Medley, M. A. J. Ottoy, P. G. Scott-Miller, M. J. Steele, George Swindells, David Taylor, H. McA. Tiffin, P. C. Trenchard, G. L. Tritton, V. C. I. Wallace, W. E. Wallace, R. N. Winnall.

Flg. Off. M. Stevens is transf. to the Admin. and Spec. Duties Br. July.

AUXILIARY AIR FORCE

MEDICAL BRANCH.—Flt. Lt. G. B. Hardman resigns his commn. and retains his rank. Sept. 28.

WOMEN'S AUXILIARY AIR FORCE

To be Asst. Sec. Offs. on prob. (emergency):—Sept.: M. E. Alexander, M. H. M. Bence, B. A. M. Caldwell, M. H. Binns, Jean Bodie, K. E. Bowen, J. M. Brent, U. S. Brodie, J. Y. Brooks, F. W. Buchanan, B. J. Bullough, J. B. Burton, B. G. Bush, B. I. Cave, M. K. Chatterton, E. W. Cleaver, D. V. Collis, A. E. V. Cobbett, B. H. Crawshaw, I. N. Cumming, A. C. P. Davenport, E. M. Ellis, Dorothy Forrester, T. M. Forster, M. C. Gane, P. M. S. Garrett, A. M. Glass, Patricia Holloway, J. M. Hacking, G. G. Hall, E. M. Hart, Bridget Hill, Rhoisia Hill, M. W. James, J. M. Jennings, F. M. A. Kennedy, J. C. Kershaw, M. E. Leach, R. M. Macalpine, Diana McGee, M. H. M. Macpherson, D. L. Macready, M. S. Manduell, R. McL. Mann, O. A. A. Mapham, C. E. May, J. S. Miller, R. M. Middleton, S. E. Molloy, A. L. Morris, H. G. Naylor, Sybil Newcomb, Phyllis Norman, D B. F. Norris, P. E. Nott-Bower, C. A. P. Osborne, L. M. Palmer, P. M. Patton-Bethune, Iva Pemberton, D. K. Powlett, J. S. Price, W. M. Rance, Mary Rayner, M. M. Robertson, M. E. Robinson, P. M. Rogers, P. K. Rogers, A. M. C. Russell-Murfitt, Mary Sanger-Davies, M. E. Ryce, M. C. Scorgie, A. H. Scott-Noble, Kathleen Scrimgeour, J. M. Scupham, O. P. Souter, M. J. Stewart, V. M. S. Sugden, J. M. Tanner, Kathleen Taylor, K. E. Townsend, P. E. Walker, H. K. Ward, H. R. Vigor, M. K. B. Wetherell, E. J. Wilkins, M. L. Worrall, Mary Young.

To resign their commns.:—Aug.: Sec. Off. P. Grice. Asst. Sec. Offs.:—M. P. Haslam, P. J. Hickey, G. A. Craig, N. C. Rogers,

Asst. Sec. Off. (prob.) G. C. Chapman resigns her commn. on account of ill-health. Oct.

AMENDMENTS.—In notifn. of June 30 concern. L. R. Watts, for May 10 read May 29.

In notifn. of July 14 concern. K. M. Dwyer, for June 10 read June 29.

Air Ministry, October 9, 1942.

ROYAL AIR FORCE

GENERAL DUTIES BRANCH.—Plt. Offs. (prob.) confmd. in appts. and to be Flg. Offs. (war subs.):—June: J. A. Dewhirst. Aug.: T. B Leigh, D. C. Moon. Sept.: H. J. H. Creswell, F. Meggison.

Gp. Capt. (temp.) E. J. Kingston-McCloughry, D.S.O., D.F.C., is granted the rank of Gp. Capt. (war subs.). Aug.

The folg. are granted the rank of Wg. Cdr. (war subs.):—Gp. Capts. (temp.): Aug.: C. M. Heard, K. S. Brake, C. J. Collingwood, D.F.C. Wg. Cdrs. (temp.): Aug.: S. C. Widdows, D.F.C., A. H. Garland, J. Grandy, M. B. Hamilton, G. A. G. Johnston.

Sqn. Ldr. J. G. Towle to be Wg. Cdr. (temp.). Sept.

Flt. Lts. (temp. Wg. Cdrs.) to be Sqn. Ldrs.:—June, 1940: B. A. C. Wood. Sept., 1940: A. W. D. Miller.

The folg. are granted the rank of Sqn. Ldr. (war subs.):—Wg. Cdr. (temp.): Aug.: T. F. D. Morgan, D.F.C. Sqn. Ldrs. (temp.): June: D. F. Rixson, D.F.C. July: J. G. D. Armour. Aug.: J. M. N. Pike, D.S.O., D.F.C., G. P. Miers, D.F.C., D. L. Amlot, D.F.C., J. McLaughlin, P. G. St. G. O'Brian, D.F.C. Flt. Lts.: July: M. E. Pollard. Aug.: J. R. Bloxam, D.F.C.

Flt. Lts. to be Sqn. Ldrs. (temp.): June: D. Shawe, D.F.C. Sept.: J. P. Ridge.

Sqn. Ldr. (short service) R. C. Ayling (now temp. Wg. Cdr.) to be Flt. Lt. (permanent) with effect from Apr. 16, 1941, retaining his temp. rank of Wg. Cdr.

Flg. Offs. to be Flt. Lts. (war subs.):—May: W. M. W. Fowler, J. K. M. Cooke, D.F.C. June: E. V. Asplin, J. R. Cooksey (Sen. May 9). July: J. Watters, J. G. Haigh. Aug.: G. A. Wilson (Sen. Aug. 9), H. J. L. Hallowes, D.F.M. Sept.: F. W. J. Paddon, A.F.C. (Sen. July 30), S. J. Mansell (Sen. May 2), D. G. T. Hayes (Sen. May 9).

TECHNICAL BRANCH.—Plt. Offs. (prob.) confmd. in appts. and to be Flg. Offs. (war subs.):—May: C. B. Shore (Sen. Nov. 25, 1941), H. R. Brooks (Sen. Mar. 3). June: A. M. Harrison (Sen. May 29).

Plt. Offs. (prob.) confmd. in appts., Feb., and to be Flg. Offs. (war subs.):—May: M. G. Hunn (Sen. Jan. 16), W. J. Scholes (Sen. Jan. 25).

Plt. Off. (prob.) V. Topps confmd. in appt., May, and to be Flg. Off. (war subs.), Aug. (Sen. Apr. 10).

The folg. are granted the rank of Wg. Cdr. (war subs.):—Gp. Capt. (temp.): Aug.: F. G. H. Ewens. Wg. Cdrs. (temp.): Aug.: A. H. Fear, H. L. Messiter.

Flt. Lts. to be Sqn. Ldrs. (temp.):—June: W. P. Spinks, R. C. Drury, M.M.

(The rest of the appointments under this date will be published next week.)

UPSETTING BRADSHAW.—Beaufighter I crews off to report after successful attacks on enemy trains in the Middle East.

STRESSES ON STUDS

The stud controversy still brings many letters to THE AEROPLANE office. Unfortunately, only a small selection can be given. The first letter below is particularly intereresting as Dr. Ker Wilson is well known for his work on stressing and vibration. He is engaged in research of this nature for one of the principal aircraft firms. The mathematical treatment of the argument in these letters, leaves no further grounds for dispute and with the publication of them we consider the discussion closed.

I HAVE NOTICED in recent numbers of THE AEROPLANE some remarks on the loading of studs. Since this is a design problem about which there has been a great deal of unsatisfactory writing it might be of interest to mention that a masterly thesis on the subject is contained in a paper by H. C. Zolotarev entitled "Stress Analysis of Engine Elements," Aeron. Eng. (U.S.S.R.), April, 1937, No. 4, pp. 48/60.

The principal finding contained in this paper is the formula:—

$$T = P + \frac{Q}{1 + \frac{k_b}{k_a}}$$

Where T = total load on bolt.
P = initial tightening load on bolt.
Q = external load on bolt.
k_a = elastic constant of the structure.
k_b = elastic constant of the bolts.
Also, if R = reaction at the bolted joint,
Then,

$$R = P - \frac{Q}{1 + \frac{k_a}{k_b}}$$

The above results indicate that with a flexible structure the load in the bolts can be greater than the initial tightening load even when the external load is less than the tightening load. Since in practice all structures are to some extent flexible, it follows that there will always be some additional load in the bolt through the application of an external load.

The joint will separate when the reaction R is zero, i.e., when:— $Q = P\ (1 + k_a / k_b)$

A special case occurs when the structural flexibility is zero, or, in other words, when the parts held together by the bolts are rigid.

In this case, k_a = O and

$T = P$; and $R = (P - Q)$.

The joint reaction is equal to the difference of the external load and the tightening load, which implies that the joint will begin to separate and the bolt will begin to carry additional load only when the external load becomes equal to the initial tightening load. In many practical cases this condition is approximately fulfilled. Indeed, it is desirable in most cases to attempt to approximate to this condition by making the structure as rigid as possible and the bolts as flexible as possible. This is particularly desirable in the case of high-pressure joints and explains the well-known superiority of metal-to-metal joints without intermediate elastic packing held together by bolts with shanks reduced to the diameter under the screw threads.

When the external load exceeds the tightening load, the joint opens and the bolt load becomes equal to the external load.

Another special, although impracticable, case occurs when the structure is flexible, but the bolts are rigid, i.e., when k_b = O.

In this case,

$T = (P + Q)$; and $R = P$.

Since the bolts cannot yield, the reaction is always equal to the initial tightening load, irrespective of the magnitude of the external load, and the bolt load is always equal to the sum of the initial tightening load and the external load.

Finally, it should be noted that when the flexibility of the structure is equal to the flexibility of the bolts, i e., $k_a = k_b$,

$T = (P + Q/2)$; and $R = (P - Q/2)$.

Here the load in the bolts is equal to the initial tightening load, plus one-half the external load, whilst the joint reaction is equal to the

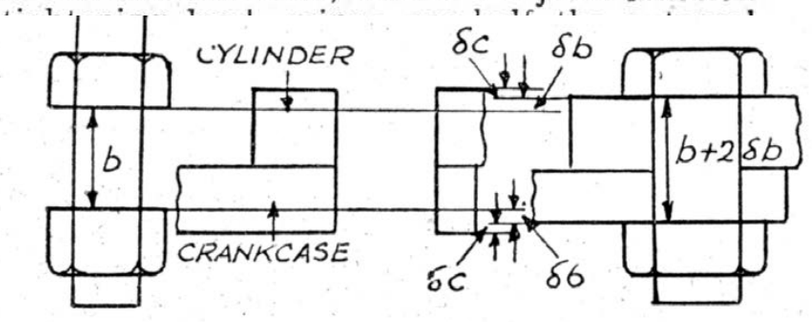


Fig. A Fig. B

load. The bolt
to 2P as the e
The correspo
to zero.
When the ex
bolt load is equ
Zolotarev als
several flexibil
washers under
the important c
tial expansion of assemblies containing parts made from dissimilar materials.

In simple cases: $k_a = E.A./L$; and $k_b = e.a./l$

Where, E = modulus of elasticity of material of structure.
A = area of structure.
L = length of structure.
e,a,l = corresponding quantities for bolts.

Then, if L = l, the formulæ for T and R can be written:—

$$T = P + \frac{Q}{1 + \frac{e.a}{E.A}} \qquad \text{and} \qquad R = P - \frac{Q}{1 + \frac{E.A}{e.a}}$$

W. KER WILSON.

NOBODY has grasped what seems the obvious explanation of your pretensioned cylinder-bolt problem.

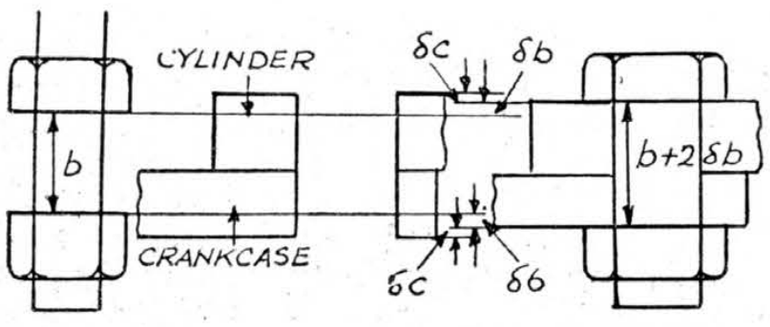


Fig. A Fig. B

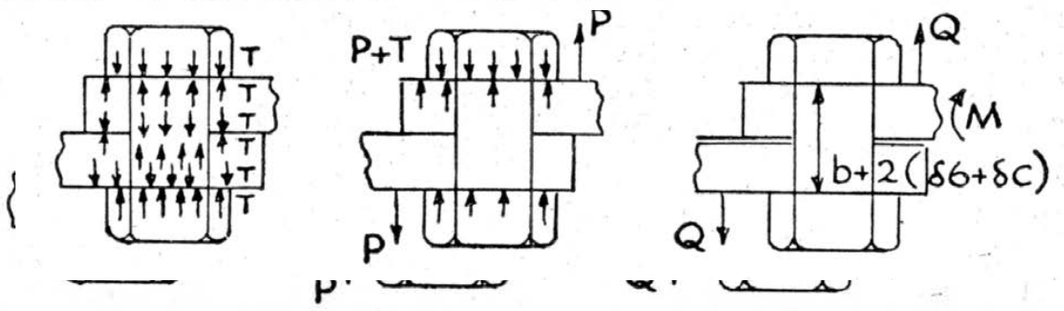
Fig. A represents the bolt placed alongside the cylinder and crankcase. Both are unstressed, but the bolt is imagined to be in the same position w.v.t. the nut as it is when tensioned and in the job.

In Fig. B the bolt is placed tensioned in the bolt hole. Suppose it has a tension T in it. This will have stretched it a distance 2 δb as shown. As this force must be opposed by an equal force supplied by the cylinder and crankcase, these latter must be compressed a distance 2 δc in order to bring them in line with the bolt.

The relationship between δb and δc will depend on the relative elasticities of bolt and cylinder materials, and on the effective area of compression round the bolt head.

Now, assuming there are N bolts round the cylinder, apply a force of NP to the cylinder head.

If this load P is not to lift the whole system it must be opposed by an equal and opposite force P applied by the crankcase. The only way this can be transmitted is through



the bolt, which must have its load increased thereby to P and T. This will stretch it a certain amount, but as long as it is less than 2 δc the cylinder and crankcase will remain in contact. When the bolt becomes stretched a distance 2 δc the cylinder and crankcase flanges will be restored to their natural thicknesses and so will just become "unstuck." The force to cause this extra extension δc on each end of the bolt will equal $T \times \frac{\delta c}{\delta b}$ by the elastic laws. As δc is probably rather less than δb, the load in the cylinder will be rather less than the pretensioned load in the bolts, and the bolt load when the flanges "unstick" is $T\left(1 + \frac{\delta c}{\delta b}\right)$

In case any one wonders what keeps the flange in equilibrium when a force $Q = T + \frac{\delta c}{\delta b}$ is pulling up on it and a bolt is pulling down with force $T\left(1 + \frac{\delta c}{\delta b}\right)$ it is the bending moment on the cylinder flange, marked M in the diagram.

PILOT OFFICER, B.Sc.

CORRESPONDENCE

[The debate on whether at long range the tail gunner of a bomber, shooting backwards, has an advantage over a fighter attacking from behind and shooting forwards, continues with unabated fury. We have received a great many letters on the subject from both points of view and publish a selection of them below. We reaffirm the fact that the tail gunner has in fact a material advantage which increases with speed, range and size of guns used. We recommend readers to consider the simplest of the circumstances; namely, that the bullets from the fighter are passing through much more air than those of the bomber and hence are subjected to greater drag forces in a given time.—Ed.]

I CANNOT ACCEPT your wind tunnel argument for a variety of reasons of which the following is the most important. An appreciable time elapses between the moment of firing and the moment of strike. During this time the bomber moves away from the bullet; the fighter moves towards it. It is quite impossible to regard the aeroplanes as being stationary with regard to each other—or you can if you like; it is not relevant. It is the length of the bullet's path which matters.

The real point is that you will not admit that the movement of gun and target has anything to do with the dynamic muzzle and striking velocities. It has everything to do with it. Suppose you have a bomber stationary in a very large tunnel, with the wind rushing past at 320 ft. per sec., and that the bomber drops a bomb to fall 1,600 ft. It will take 10 secs. to fall—and it will hit the ground slightly behind the aeroplane and not 3,200 ft. behind. In exactly the same way a bomb dropped from an aeroplane at 1,600 ft. and moving at 320 ft. per sec., falls slightly behind the aeroplane, not directly under the spot where the aeroplane was when the bomb was released. In this case the nominal muzzle velocity of the bomb in a forward direction is zero; the dynamic muzzle velocity is 320 ft. per sec.—that of the bomber.

The bomb definitely does move forward, and it can do so only because it possessed the forward speed of the aeroplane. Any projectile fired forward from a gun in the air will move initially with that velocity which it would have if the gun were fired from the ground plus the velocity of the carriage—which, in this case, happens to be an aeroplane.

One final point. Your statement that the resistance to a bullet varies by more than the square of the speed seems to me to be untrue. You are forgetting, I think, that we are considering speeds approximately double that of sound, under which conditions the suction at the base of the bullet is much more important than the wind resistance at the head. Now the suction is practically independent of the velocity from 1,500-3,000 foot seconds. It follows that, at these velocities, the loss in velocity per 100 ft. is practically independent of the velocity. Indeed, it is possible to design a projectile such that its loss in velocity per 100 ft. is nearly a constant. Most bullets in the Services approach this ideal. I know nothing of 0.5-in. calibre bullets, but I would be surprised to learn that they are in any way exceptional in this respect. If they are, the sooner our fighters get a new bullet, the better. Further, air combats usually take place at great heights, where the air density and, therefore, the deceleration of the bullets is abnormally small. D. STOCKDALE.

MAY I crash into the discussion on fire power and the tail turret and restate the problem in terms conformable to mid-20th Century standards of international relations?

Assume that, on a calm day, two flush-deck destroyers of the Royal Navy are proceeding at 30 knots in line astern with an interval of 6 ft. only, a feat of station keeping which obviously narrows the field to the R.N.

Leaning on the stern rail of the leading destroyer and facing aft is Mr. Stalin, silent, inscrutable and smoking a pipe.

Well up in the bows of the second in line is Mr. Hitler, facing forrad and addressing Mr. Stalin at length on some favourite theme, say "Bolschevismus."

Having completed his peroration, exhausted his patience and repertoire, he draws a careful bead on Mr. S. and rashly, being a landsman, expectorates somewhat violently up-wind in the general direction of Mr. Stalin.

A second or so later the latter, removing the pipe and a grin from his face, returns the compliment in kind with equal force and accuracy of aim.

Somehow, I can't help thinking that the rear gunner has the ballistic advantage over the attacking fighter. H. A. JUDD.

I DO NOT think that the tail gunner of a bomber has any appreciable advantage over the fighter pilot. First, there are those highly dangerous terms, "with the wind" and "against the wind." The tail gunner is said to be firing "with the wind." Actually, both bullets travel into the relative wind, or, to put it another way, there is a pressure on both their noses.

Next, you give figures showing that, at the moment of discharge, the velocity in air of the fighter's bullet is higher than that of the bomber's bullet. That is correct. You conclude that the drag of the fighter's bullet is much higher owing to the drag varying as the square of the speed or at a higher rate at super-sonic speeds. Again, the reasoning is impeccable. But it does not appear to have been noticed that a bullet must move fast and, therefore, must have high drag if it is to have high hitting power. Outside a vacuum, you cannot have hitting power without drag. A 15-in. shell has more drag at the same speed than a .303 bullet, and it has greater hitting power because it has greater momentum.

Now that gives the clue to where your reasoning has broken down. Hitting power has to do with momentum. Momentum is the product of mass and velocity. You can hit a man on the head with a length of lead piping or with a rolled-up tube of tissue paper and the external shapes, speed of movement and, therefore, drag of these two "blunt instruments" can be the same. But the man will find that the lead piping hurts more than the rolled-up tissue paper. The reason is that although its drag and velocity are the same, its momentum is greater.

If the tail gunner and the fighter pilot were engaged in a pillow fight or were throwing toy balloons at one another, the tail gunner might have an advantage. But where bullets are concerned there is no appreciable advantage on either side, the increased velocity (and, therefore, the greater hitting power) of the fighter's bullets being balanced by the relative direction of movement of the two machines. ÆOLUS.

YOU SEEM to have "dropped a brick" over this controversy. You say: "Initially, the fighter's bullets are travelling between the fighter and the bomber at the same speed as those of the bomber."

Now, surely, the speed of a bullet is only relative to the gun. If that gun is travelling in the direction of fire, then the resultant speed of the bullet is increased, and vice versa. Thus, the fighter's bullets have the initial speed of the fighter added to their normal muzzle velocity, while the bomber's bullets have the speed of the bomber (which is in the opposite direction) subtracted from their normal muzzle velocity. Obviously, you will see that neither aeroplane has any advantage.

It is quite convenient, and I think clearer, to consider the problem by the actual velocities relative to the ground.

Suppose the two aeroplanes are 2,400 ft. apart, travelling at 320 ft./sec. and their bullets have a normal muzzle velocity of 2,400 ft./sec.

Then actual velocity of bomber's bullets = 2,400 − 320 ft./sec. The actual velocity of fighter's bullets = 2,400 + 320 ft./sec. If the two start together, then after one sec.:

(i) Bomber's bullets have gone 2,400 − 320 ft. towards fighter. But fighter has flown 320 ft. towards bullets. Therefore bullets just meet fighter.

(ii) Fighter's bullets have gone 2,400 + 320 ft. towards bomber which has flown 320 ft. away from bullets. Therefore bullets just hit bomber. (Air resistance to bullets can be neglected, as it is the same for bomber as for fighter.)

K. J. W. SADLER.

[Mr. Sadler ignores the fact that the fighter's bullets have to move through much more air than those of the bomber in a given time. This "expends" the bullets of the fighter more rapidly; the longer the range the more the effect.—ED.]

SURELY your article concerning "Fire Power and the Tail Turret" is basically wrong. Let us consider your example; the fighter and the bomber are flying at a speed of 220 m.p.h., the fighter being directly behind the bomber.

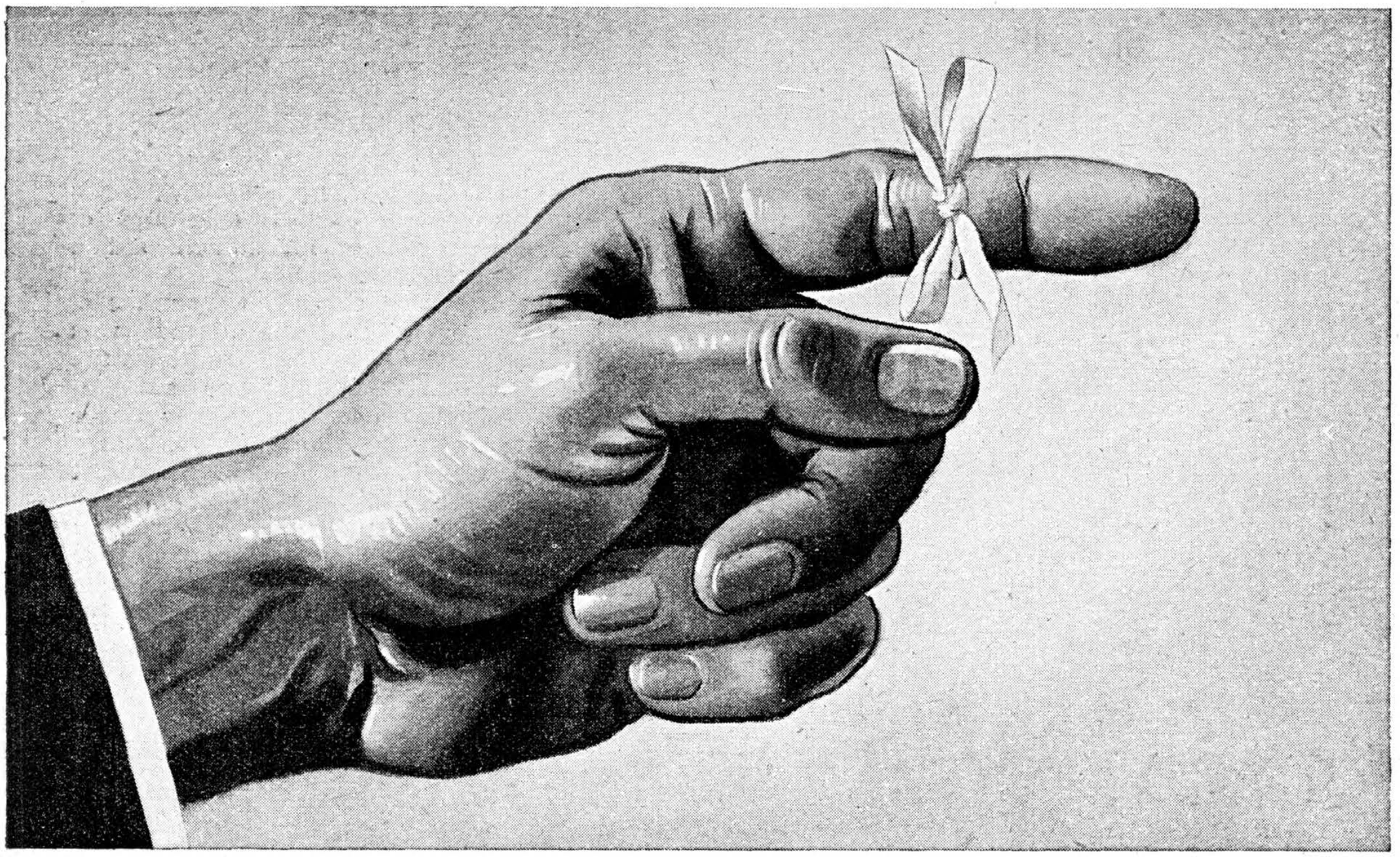
Take the fighter first; the ammunition of the guns has an initial velocity of 320 ft./sec., therefore when the guns are fired another velocity of, say, x ft./sec. is *added* as both velocities are in *one* direction. Now consider what happens when the bullets hit the bomber; they are travelling at (x + 320 ft./sec.) into an object which is moving away at 320 ft./sec., therefore entering the machine at their initial muzzle velocity of x ft./sec. minus their loss of velocity due to air resistance.

The same argument can be applied to the bomber, though here the bullets will leave the guns of the tail turret at a velocity of (x − 320 ft./sec.) as the two velocities are in opposite directions. But here the bullets will enter the fighter at x ft./sec. as it is moving into the bullets.

Your whole reasoning fails because you have tried to bring the two aeroplanes and the bullets to rest by simply making a wind of velocity 320 ft./sec. flow over both. You cannot do this; the aeroplanes are flying in the same direction, whereas the bullets are travelling in exactly opposite directions.

NOEL G. LYNN THOMAS.

[If both aeroplanes are flying at the same speed neither is moving away from the other. Therefore the influence on the bullets is solely the resistance of the air, which is obviously much greater on those of the fighter.—ED.]



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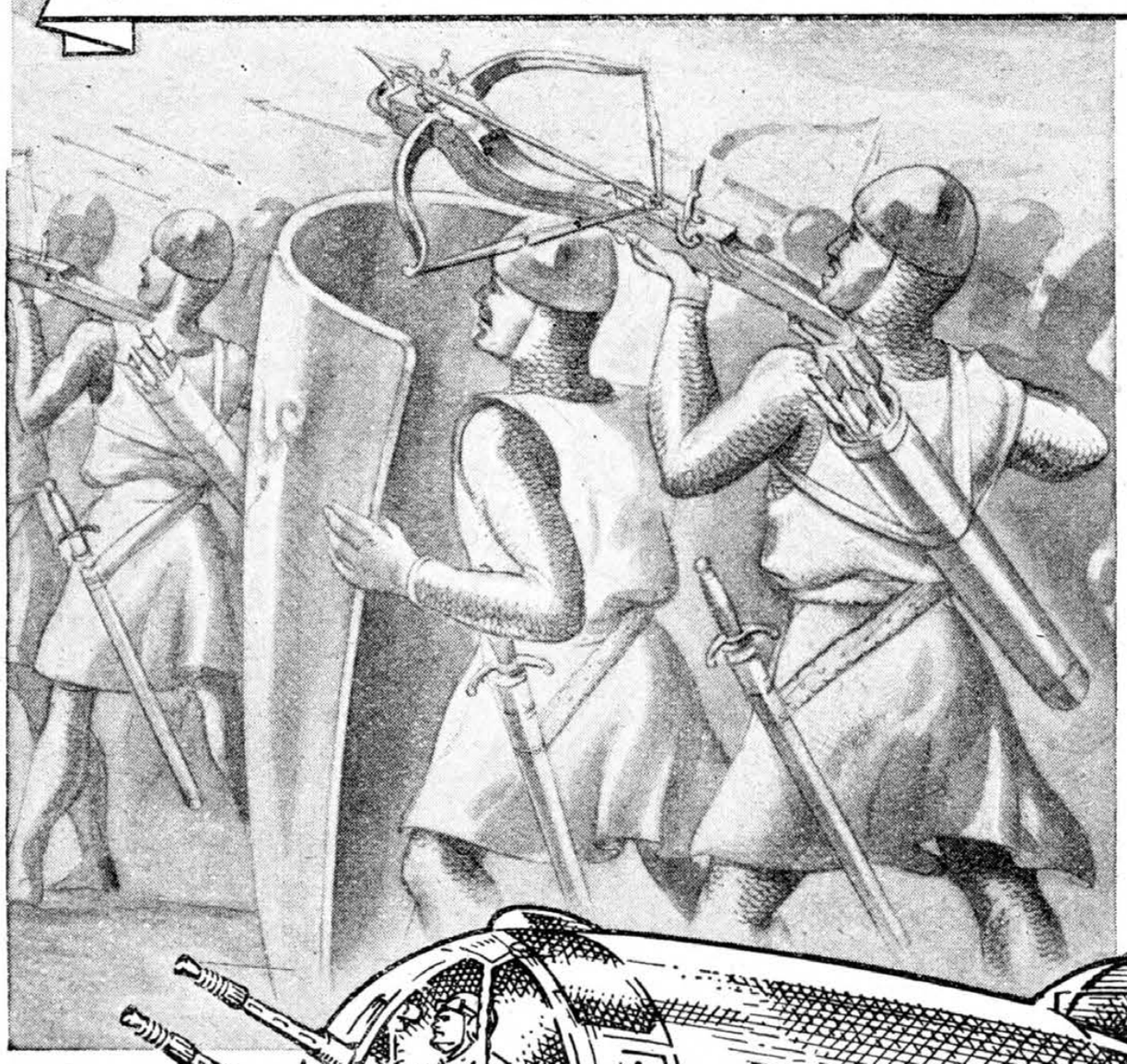

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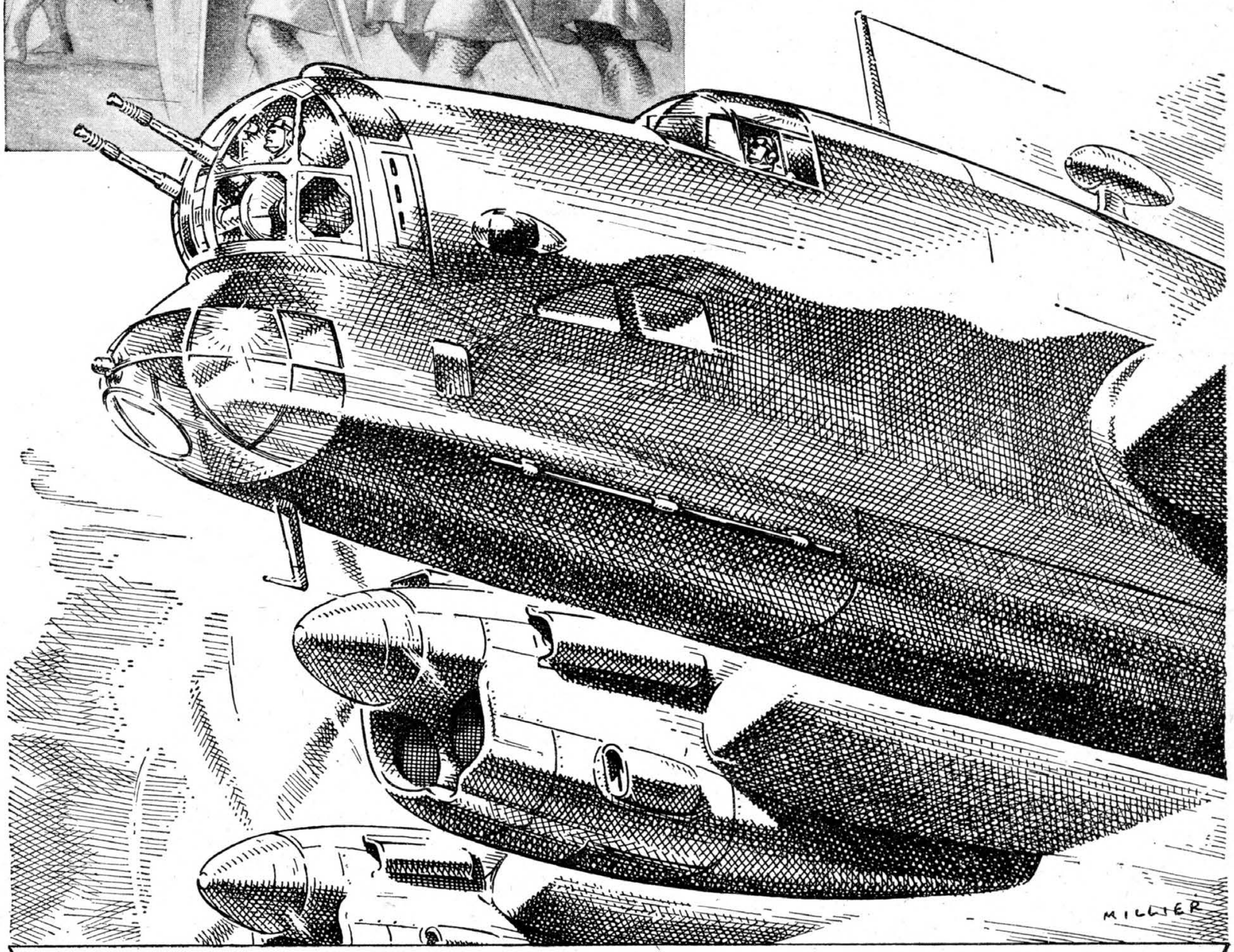

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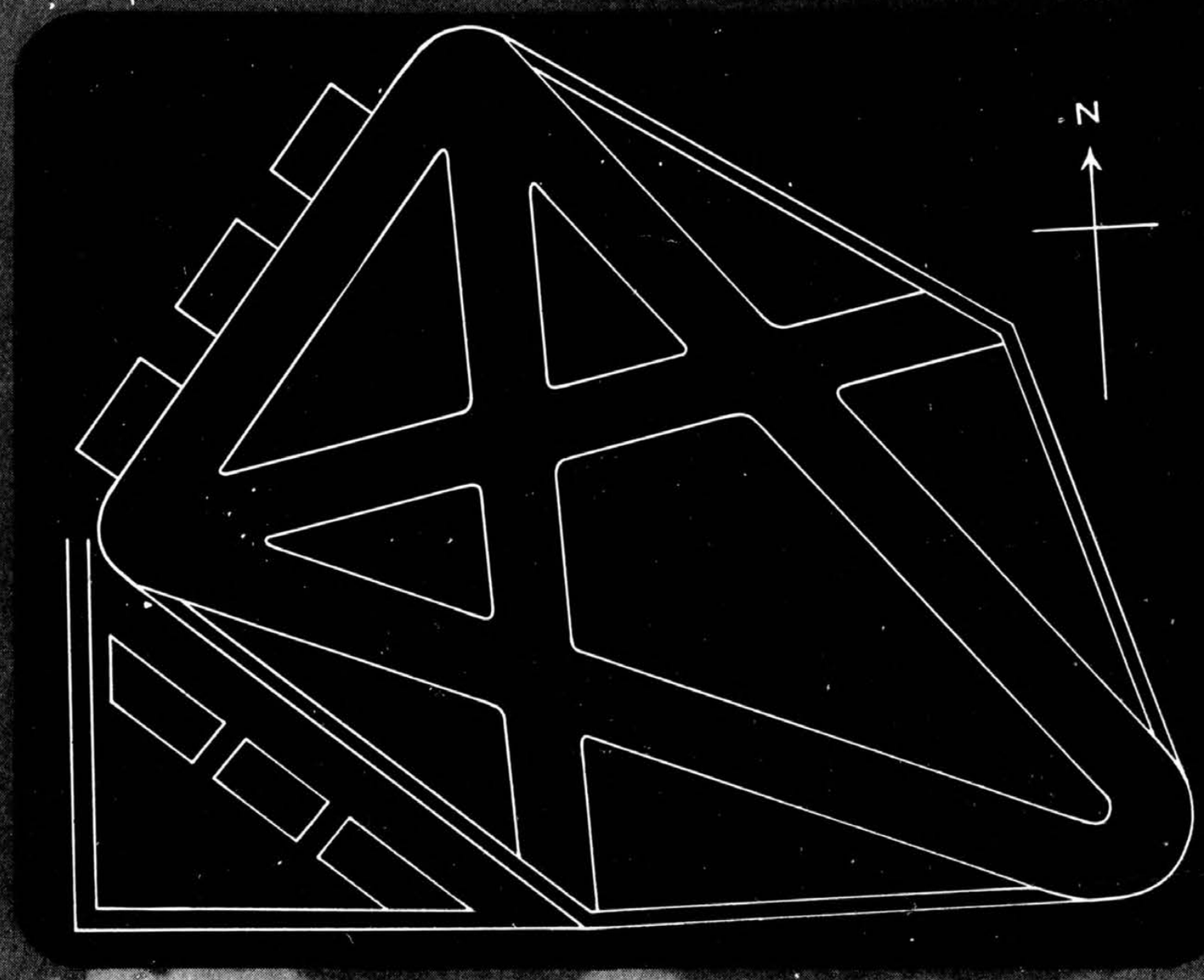

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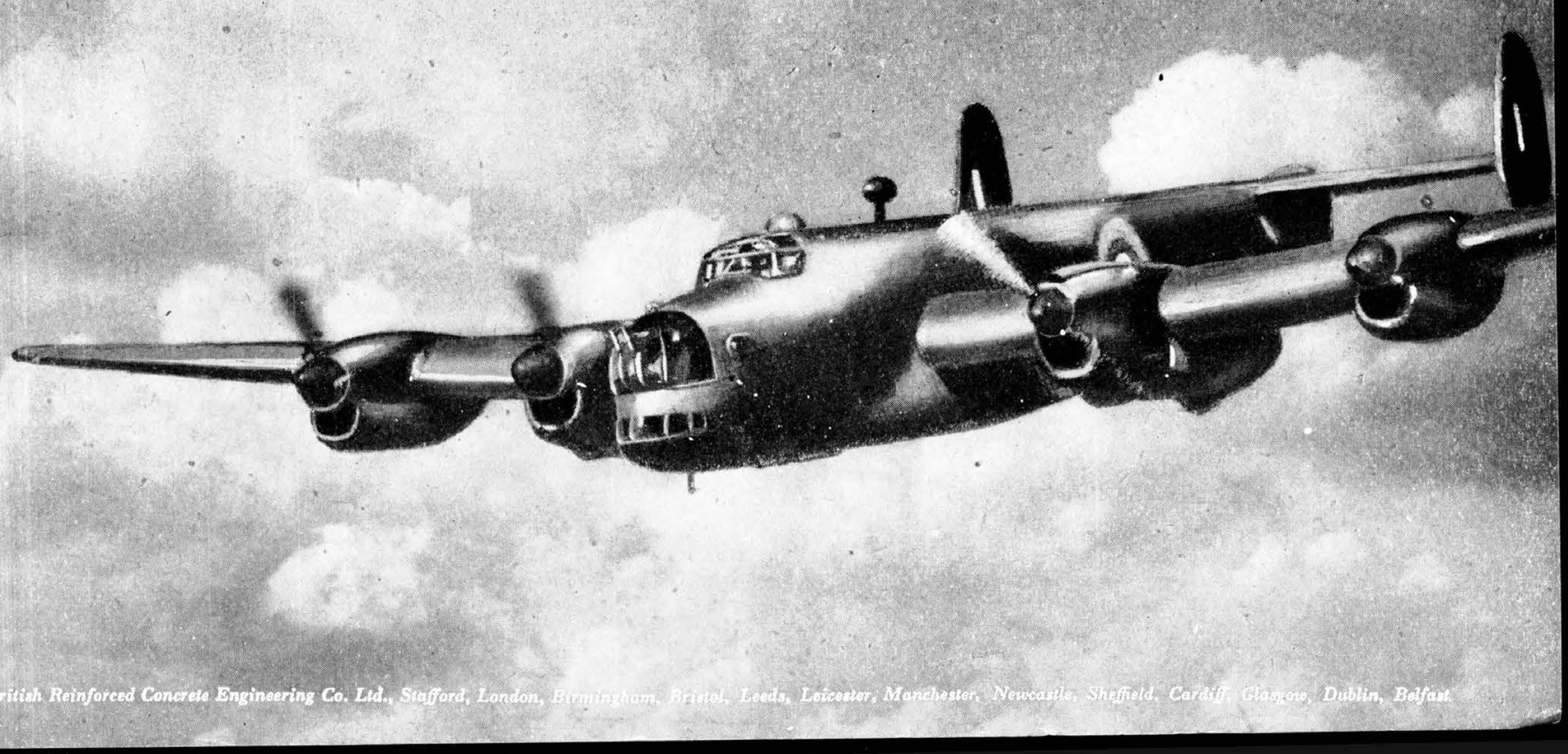

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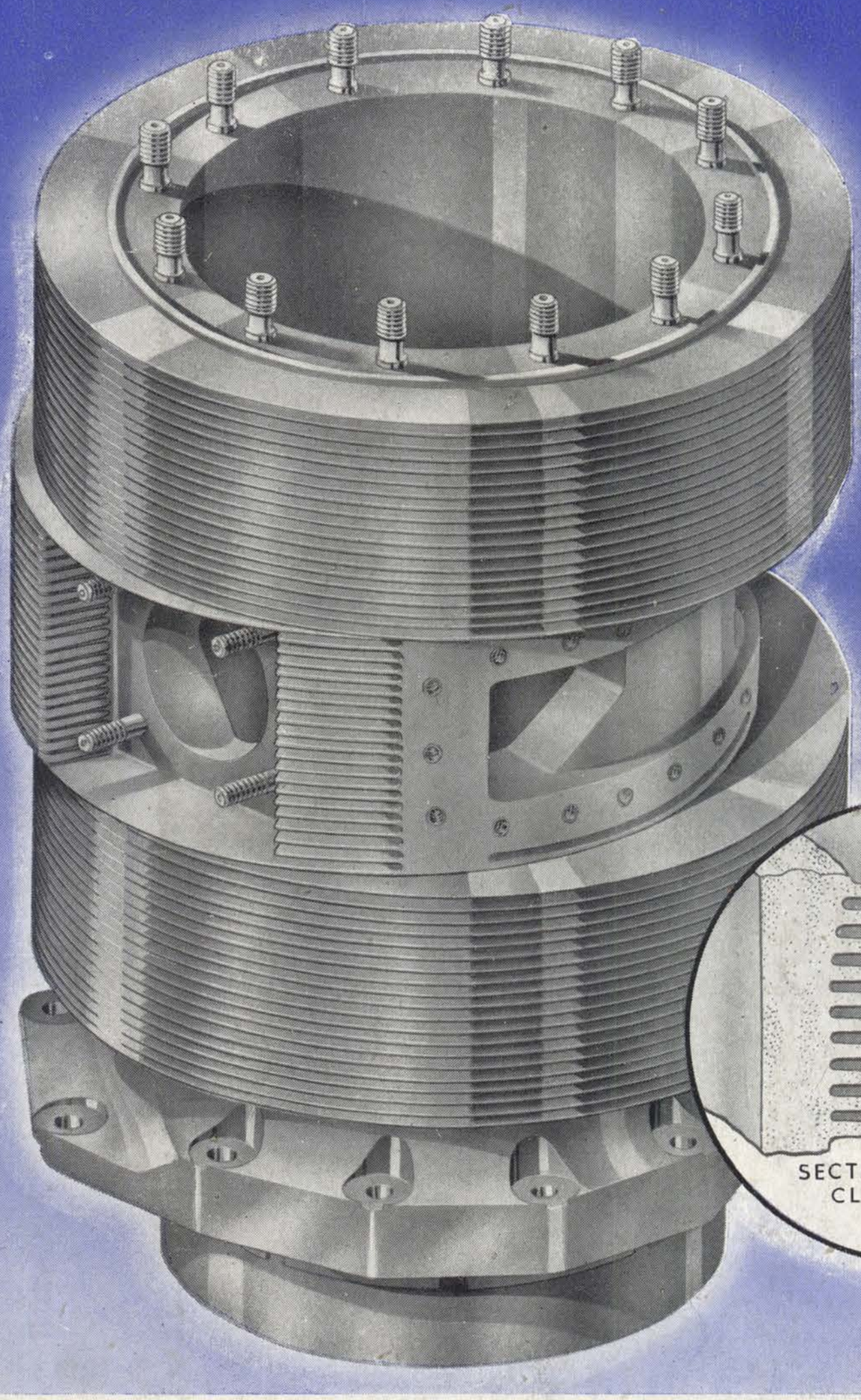

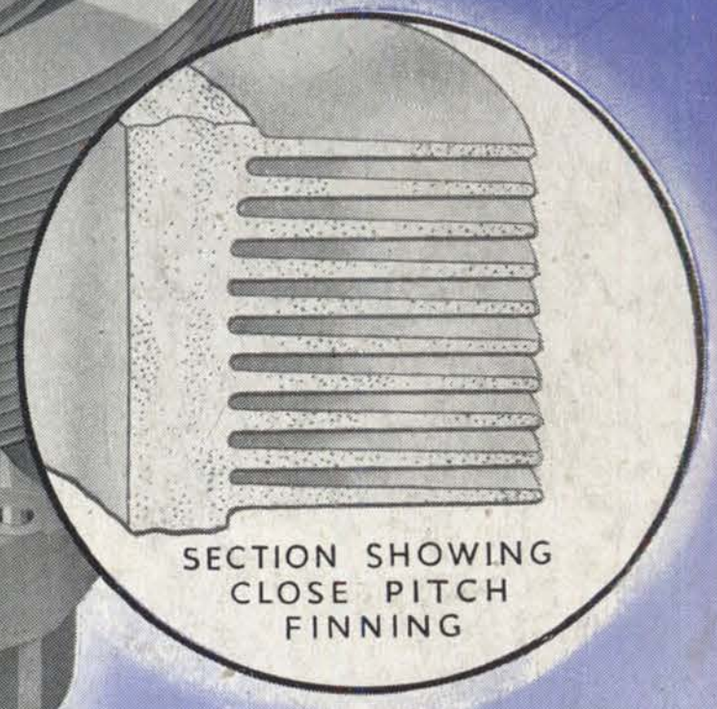

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