

West African TECHNICAL REVIEW

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International Magazine for Industrial & Business Management

July 1978

This issue:

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Safety in the Office

Rough Terrain Fork Lifts

Mechanisation in Agriculture

**West African
CONSTRUCTION**

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Concrete Plant

Forming

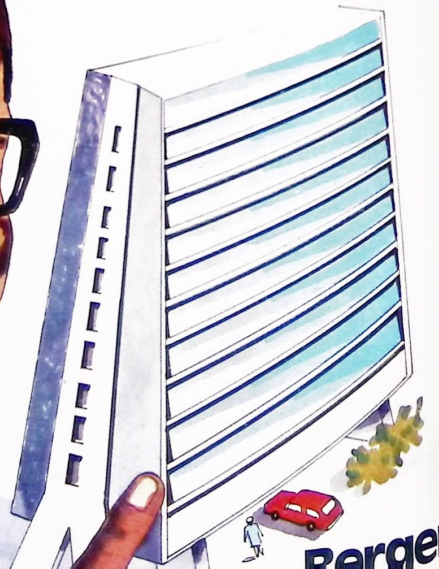
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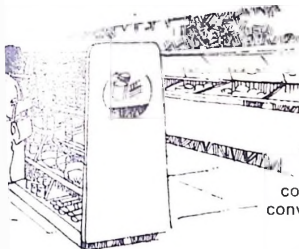
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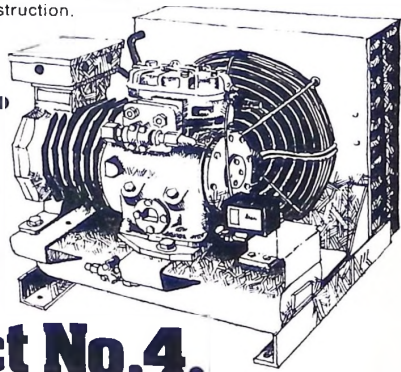
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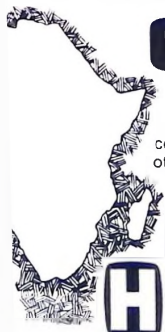
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Safety in the Office

Each year thousands of accidents occur in offices as a result of general carelessness and misuse of office equipment. This article, compiled by Air Products Ltd., outlines the main danger areas in an office and suggests positive ways of reducing these accidents 33

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The word processing revolution has begun and this article written by a special correspondent looks at word processors and their applications 39

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This article gives some hints for a businessman's first trip to Paris, looking at accommodation and eating and shopping places, giving a few warnings about what to beware and also how to behave when conducting business in France 47

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WEST AFRICAN CONSTRUCTION

In this and every other issue, we publish news items and features on the construction and civil engineering industry. In this issue of West African Construction we feature:

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Commercial Vehicle

Late in 1977 the UK-based Crane Fruehauf Corporation was taken over by the world's largest trailer maker, the American Fruehauf Corporation, which, until then, had held a minority shareholding. Here Alan Bunting looks at CF's export activity in West Africa 141

Plus — Product Digest

This month's cover: An Air Liberia captain flying a Britten-Norman Islander, coming in to land at Spriggs Payne Airfield in Monrovia. For more information on aircraft and West African airports, see pages 53-65.

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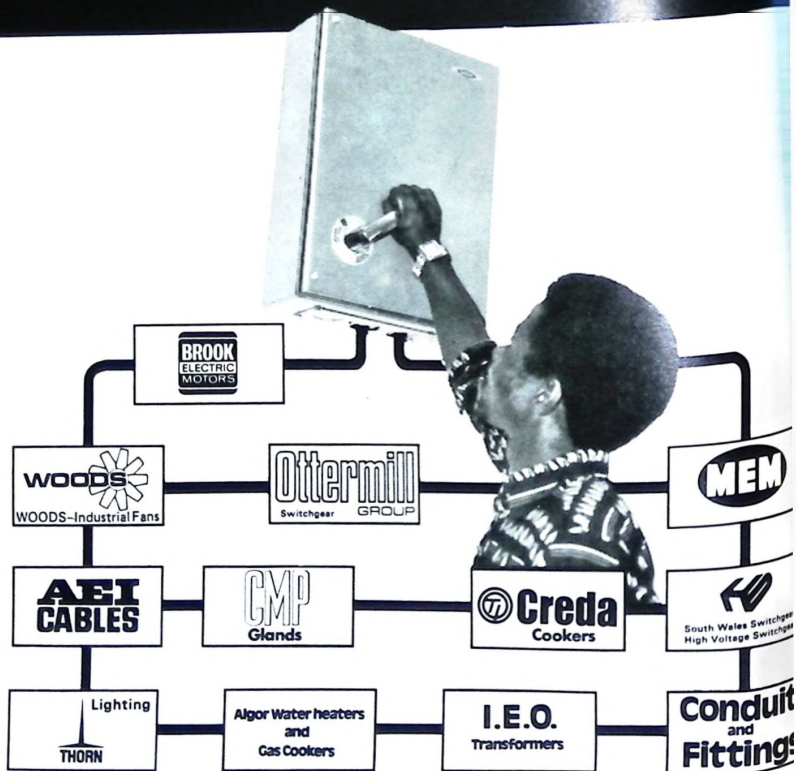
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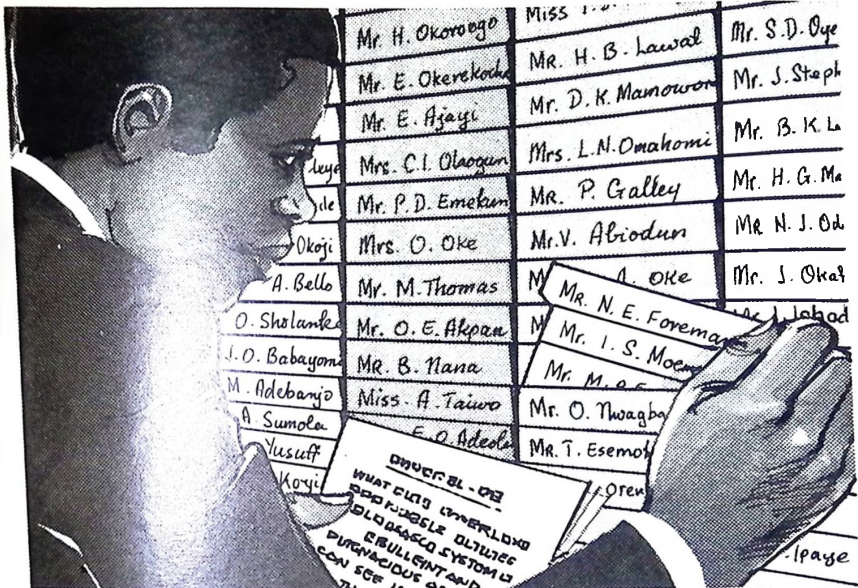
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Commercial review

DAF build buses and trucks in Ghana

DAF has provided technical and, initially, trucks in Ghana as the first step in a five-year plan to strengthen its position in the international vehicle market. Autoports Ltd in Accra has begun assembly with capacity for two trucks a day.

DAF has provided technical and initially, management assistance to Autoports, but has no financial stake. Production in the Ghanaian market at first, but exports to other West African countries are expected later. Assembly in Ghana has been started because of the difficulty of getting import licences. DAF is also studying the potential for assembly in other countries, notably Nigeria.

More oil found in Chad

It is reported that a consortium which includes Exxon of America, Continental Oil, and Chevron, all with a 12.5% stake and Shell with the lion's share of 50% have come up with another small find similar to that of a few years ago at the Miandoum One well.

The consortium, busily exploring a 43 million-acre tract, has repeated the success with its Mangera One well which is believed to have enough flow to satisfy Chad's present demand of an annual 70,000 tons. To establish the overall capacity of the area more drillings are expected to take place at the Mangera find. The original success drilled at Miandoum Well was about the same capacity as Mangera.

Much lower oil production forecasted

Last year Nigeria produced just over 765 million barrels of OPEC's most highly-priced volume crudes, averaging 2.10 million barrels/day. This figure however was well below the country's peak output of 2.25m b/d in 1974. The table below gives a breakdown of oil production by company for 1977. At present, the drastic cuts in production and cost could cause the figures given in the table to fall a further 20 to 30 per cent.

NIGERIA: 1977 OIL PRODUCTION BY COMPANY

Thousand barrels	Gulf -NNPC	Mobil -NNPC	AGIP -Phillips -NNPC	Ef -NNPC	Tessco -NNPC	NNPC -Ashland	Pan Ocean
company totals	108 078	81 539	77 872	29 005	19 398	2 324	3 585
445 674							

WACHEM grows

A trade agreement has been signed by West African Chemical Company Ltd. (WACHEM) a leading pest control concern and Agro-Aviation Services Company, with the Cyanamid International Sales Company, USA. Under the agreement WACHEM is to distribute Cyanamid insecticides and herbicides in Nigeria.

Cyanamid's products are well-known in the world market, for example Malathion and Abate are two insecticides recommended by the WHO for the control of mosquitoes in public health pest control.

WACHEM has also developed agro-aviation services. Contracts have already been executed for some State Governments, including the spreading of granular fertilizer on the sugar cane plantation at Bacita and post emergence herbicide spraying on rice fields at Shonga, Kwara State. West African Chemical Company now has branches in six states of the Federation, and plans to open two more shortly. The company is rapidly becoming a major distributor of agricultural and public health products in Nigeria.

Sapele gets gas power station

A new thermal power station being built by NEPA in Sapele, Bendel State, is to be commissioned soon. Two of the generating units with a total capacity of 240 megawatts are expected to become operational by August this year. Four more generating sets will further be commissioned at intervals of six months to bring the total generating capacity of the station to 720 megawatts.

Smallpox believed eradicated

The World Health Organisation, Geneva has announced that the world's last possible case of smallpox was recorded more than half a year ago. This was announced by chief of the WHO. Smallpox eradication unit who believes the world is now rid of the disease. It is the first time in medical history that a major disease has been wiped off the map.

Datsun car assembly plant planned for Ilorin

The Federal Government's proposed Datsun car assembly plant is now to be sited at Ilorin, the Kwara State capital.

Construction of the giant plant is expected to start before the end of this year.

According to Dr. R. A. Adeleye, Federal Commissioner for Industries, the plant will be Nissan's biggest car assembly unit outside Japan.

Initially the plant is scheduled to produce some 100,000 cars of various capacities annually and these will include all its brands ranging up to 2,000cc.

Visitors to Europe need more money

According to a recent survey published by the magazine Business Traveller, it now costs a visiting foreign business executive over £50 a day to stay in London. The cost of a good hotel room with bath "decent" meals, taxis and underground fares, newspapers, laundry and telephone calls mounts up to £53 daily, it says.

Although this represents a 15% increase in the past eight months, London is still less expensive than most other European cities as the above chart shows. The most expensive in the world is Kuwait.

City	
Kuwait	£226
Brussels	£135
Amsterdam	£121
Zurich	£117
Paris	£113
London	£ 53
Lisbon	£ 44

New cocoa prices?

The Cocoa Producers Alliance recently met in Yamoussoukro, in the Ivory Coast to formulate a joint position for the forthcoming renegotiation for the International Cocoa Agreement with consuming countries.

The Alliance, grouping the main producing countries — Nigeria, Ghana, Ivory Coast, Brazil, Cameroon, Equatorial Guinea, Togo, Liberia, Gabon, etc — is dissatisfied with the floor and ceiling prices of the current agreement due to expire in October. The Alliance would like to see a substantial increase in the new agreement.

TPI to train UN students

The Tropical Products Institute has become a training centre for the United Nations University. This means that TPI will now be one of the associated institutes providing specialist training in various aspects of post-harvest science, technology and economics for UNU Fellows from developing countries.



IN MEMORIAM
CHIEF L.A.O. BANJOKO

Messrs Afrotec Technical Services Nigeria Limited
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Commercial review

Fire fighting seminar in Kaduna

Guthrie Nigeria Ltd. through its Fire Fighting Division is organising a Fire Fighting and Vehicle Maintenance Seminar for fire brigade engineers and mechanics in Kaduna.

The seminar is to last for three days in Kaduna, and it has been organised to

ensure that all personnel handling the vehicles know the technological details of their equipment.

"Times" exhibition for telecommunications

The Times Telecommunications and World of Electronics Exhibition is to take place 23-29 July. The exhibition, organised by Daily Times Ltd. is going to be one of the most fascinating of its kind with many companies displaying their latest technology.

According to the organisers, already almost all the major electronics firms operating in the country have bought space here. These include, among many others, Marden Electronics Ltd., NET and Joes Electrical Industries.

Conference on civil aviation

A conference to discuss ways to raise \$110m in new aid funds for civil aviation development in Africa in Geneva last week under the auspices of the International Civil Aviation Organisation and the Organisation of African Unity. More than 40 African states and other interested countries and organisations attended.

Training alone is estimated to need \$61m with the rest needed for specialist aviation equipment, new airports and other facilities, excluding aircraft.

EXECUTIVES' CALENDAR

A monthly service listing the major events in West Africa and around the world that could be of interest to our readers. Further information on most events can usually be obtained from the commercial office of the embassy of the country concerned.

AUGUST

15-1 Sept.	World Trade Centre	WELLINGTON
27-30	Frankfurt International Fair	FRANKFURT
28-1 Sept.	BYGGG International Building Exhibition	GOTHENBURG
31-14 Sept.	SELCO and TECHNICA International Exhibition of Agricultural Machinery	MOSCOW
30-3 Sept.	"Parisian Progress" Overseas Import Fair	BERLIN

SEPTEMBER

7-18	International Trade Fair	STRASBOURG
8-17	International Machine Tool Show	CHICAGO
9-24	Lausanne National Fair	LAUSANNE
12-15	3rd International Security Exhibition	ESSEN
13-21	International Machinery Trade Fair	BRNO
14-17	GOLVEX-FIM International Fair of Floor & Wall Materials, Paints, Cleaning	STOCKHOLM
14-20	International Ophthalmology Exhibition	KYOTO
15-20	12th International Trade Fair of the Food Industry	MUNCHEN
15-21	PHOTOKINA — World Fair of Photography	KOLN
16-20	VISUMAT — International Commercial Equipment Trade Fair	BRUSSELS
16-21	International Market for Video Communications	CANNES
16-24	German Industries Exhibition	BERLIN
19-21	EUROSAF International Industrial Safety and Security Exhibition	GENEVA
19-23	AQUATECH — International Exhibition for the treatment, storage and use of water	AMSTERDAM
22-24	SICOB — International Exhibition of Data Processing of Communication and Office Organisation	PARIS
22-1 Oct.	International Autumn Fair	BUDAPEST
23-25	QUOJEM — Hardware Trade Show	PARIS
23-27	AUTOMECHANICA — International Trade Fair for Equipment for Motor Car Workshop and Service Station	FRANKFURT
25-29	FURNACES 78	BIRMINGHAM
25-29	International Broadcasting Convention	LONDON
26-30	Office Equipment Trade Exhibition	STUTTART
26-30	International Ship Machinery & Marine Technology Exhibition	HAMBURG
27-1 Oct.	ILMAC — International Exhibition of Laboratory, Chemical Engineering, Measurement & Automation Techniques in Chemistry	BASLE

Nigeria exhibits at 9 international fairs

Nigeria is participating in nine International Trade Fairs during the current year. The fairs are being held in Mozambique, Bulgaria, India, Poland, Botswana, Austria, Zambia and Senegal.

CBI conference on West Africa

At a conference on West Africa held at the London headquarters of the Confederation of British Industry, the speakers were Mr P J Code (Barclays Bank International) who spoke on the Nigerian budget, and on financial aspects of trade and investment in Ghana and Sierra Leone; Mr J Clark (UAC International) who spoke on developments in Ghana; Mr Bankole Timothy (PRA on African Affairs to the Diamond Trading Company and The Central Selling Organisation) who spoke on Sierra Leone, and Mr W. Paxton (West African Committee) who spoke on Francophone Africa, with particular reference to Cameroon and Gabon. The ambassadors of the Ivory Coast and Senegal spoke on the investment opportunities offered by their countries and Mr. C Metherill of Tennant Guaranty, on the role of export finance houses in Africa.

Afrotec co-founder dies

Chief Banjoko, well known in the indigenous construction industry died suddenly in Ibadan early in May.

Chief Banjoko played a pioneering role in the Nigerian construction industry and also welcomed expatriate participation on terms favourable with Nigerians. He set up several construction companies, including Tibury Nigeria Ltd, and his realisation of the growth of the potential technical distribution business led him to being a co-founder of Afrotec, of which he remained an active director.

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Commercial review

Diamond boost for Sierra Leone

The Central Selling Organisation has announced the surcharge being charged at London diamond sales from 40 to 15%. The surcharge, which has been passed on to producers, including Sierra Leone, and is helped to maintain or increase their returns, was introduced to reduce speculation in diamonds.

It is believed that there may be a rise in official prices in the near future, if the markets continue to be reasonably strong. Although production in Sierra Leone is falling in quantity, revenue is actually benefiting.

Lagos/Ibadan Expressway

The first express way in Nigeria is to be opened soon. The 109 kilometre road which links Lagos, the Federal Capital, with Ibadan, capital of Oyo state, has been built at a cost of about ₦170m.

Work on the road began in 1974 and was divided into three sections. The contract for each section was awarded to Julius Berger, Dumez and Strabag.

NOVIC expands

The Management of Nigeria's only upholstery textile manufacturing company, Novelty Industrial Company Ltd (NOVIC) is carrying out an expansion programme to increase its manufacturing capacity.

As part of the expansion programme the company is bringing in six additional modern weaving machines, four are already in the country, which are expected to be used to double or triple its production capacity.

The actual production capacity of NOVIC is 2,400 metres daily. Novic's proposed expansion is intended to cope with the continued growth and also with changes within the upholstery market itself, to meet the increasing demand for industrial gloves sponges.

Nigeria increases telephone system

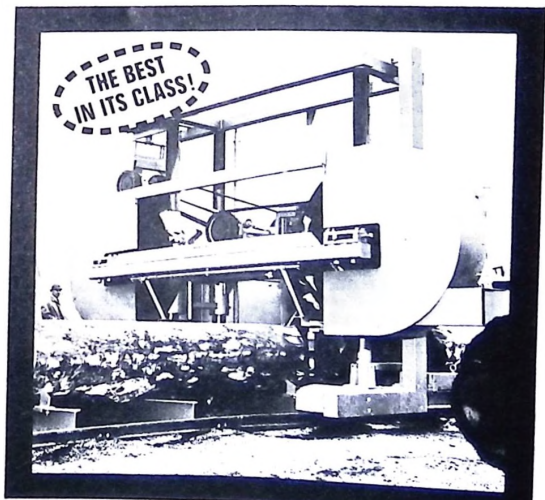
Nigeria is planning to increase its telephone system by some 700,000 lines by 1980 as a means of making more telephone and telex services available in different parts of the country.

It is hoped that 190,000 telephone lines at about 45 locations in the country will be ready by the end of this year.

Lugar-cement joint venture

The joint ventures in cement and sugar production proposed several years ago by Nigeria and Benin is to get underway. Major Ammosu, the Benin Finance Commissioner said inter-regional ventures could be encouraged among West Africa countries demonstrating the spirit underlying the formation of ECOWAS.

A small Petter diesel powered pump, refuelling a Nigerian Airways jet at the remote Maiduguri airport. NMI (Tarmac) Ltd. are the distributors of Petters engines in Nigeria and provide the necessary after sales and spares facilities. With the ever increasing demand for electricity out-tripping the national output there is a heavy demand for Petter powered generating sets.



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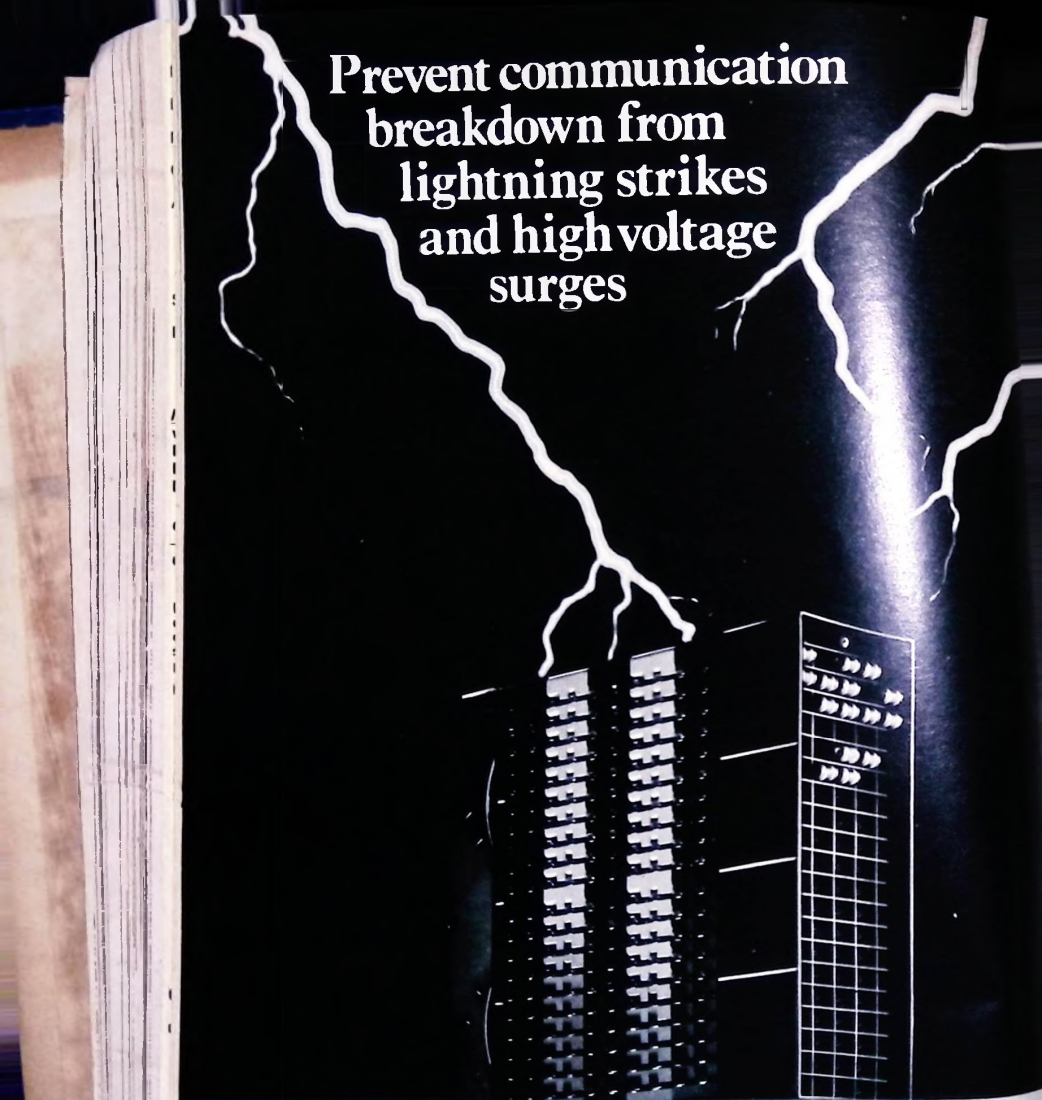
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Wales II

The African Insurance Scene Problems of a Growing Continent- Wide Industry

EDUCATION AND public relations to improve the insurance industry's "tarnished image"; how to tackle the massive potential market in agricultural and crop insurance; the possibilities of credit insurance; how to retain more aviation insurance within the continent; the increasing demand for personal insurance; the need for more exchange control flexibility — these were some of the important subjects under discussion at the sixth annual conference of the African Insurance Organisation, held in Nairobi in early June.

West Africa prominently represented

West Africa, particularly Nigeria, was prominently represented among 510 members and observers. One of the key speakers was Mr Edward Mensah, General Manager of the African Reinsurance Corporation, the headquarters of which are in Lagos.

Known in the insurance world as "Africa Re", it now comprises 25 member states, who, with the African Development Bank, have shares in the organisation.

Mr Mensah said that Africa Re had to become not only a reinsurer of the majority of African companies, but also "to become a truly international professional reinsurer for all insurance companies throughout the world."

The African Reinsurance Corporation, he said, recognised the nature of the developing countries' outcry for a new international order which regards the advanced countries as "partners in development". This was recently confirmed by all-African development leaders comprising the board of governors of the mother institution, the African Development Bank, which last month opened up the capital structure to non-African participation, after 14 years of active life.

Mr Mensah said that Reinsurance from its earliest days had been "a truly international business, assuming and spreading risks worldwide."

The conference plunged into the many problems of the insurance business in developing African countries.

It was agreed that not only must the masses of the people be educated in the uses of insurance, but staffs also had to be educated — "the biggest single task facing the industry".

Progress had been made in staff education with the establishment of the specialised insurance institute at Yaounde in 1973. Another is to be established in Monrovia, and a decision has been taken to establish an insurance educational centre in Nairobi.

Training institutes, it was emphasised, had to be specifically orientated towards the current social and economic conditions applying in the various countries of the continent.

Many delegates thought that the subjects of education and "the public image of insurance" were inter-related. All agreed

that the insurance image was "tarnished" and needed improvement.

This could be achieved only by staffing with properly trained personnel, who not only understood the technicalities of insurance but were able to adapt traditional covers to suit the requirements of the mainly rural and agricultural population, and were able to explain and "sell" them.

Insurance language too complex for general public

Ways and means must be found to put over insurance covers in easily understood language, it was thought — "the insurance business is too complex to be understood by the large majority of the public." Simple versions of various insurance covers could be made available to the public through radio, TV and newspapers.

This call for big public relations campaigning to spread better understanding of what insurance is all about was made by Mr. S. V. N. Ngwiru, Managing Director of the Kenya National Assurance Company.

"Insurance is a very big innovation in the African way of life and this is a big problem," he said. "There is a big job to educate the masses..."

Big demand for agricultural insurance

There was a unanimous belief during discussion sessions at the conference that there was a big demand for Agricultural Insurance throughout Africa, and also a recognition of the enormous problems in that field.

Delegates underlined the difficulties encountered in underwriting Crop Insurance. In two countries where this was available it had to be subsidised by the Governments.

"If you stop to think for a minute about the rating and claims settlement problems involved in the insurance of cows, horses, pigs, goats, camels, chickens and ducks, and the rating and claims settling problems on standing crops like coffee, tea, wheat, sugar, maize and pyrethrum, which by no means covers the whole field, it is understandable how difficult the problems are," said Mr. D. H. Stewart-Brown, Managing Director of the Jubilee Insurance Company of Nairobi.

Mr. A. F. M. Siyam, of Sudan's General Insurance Company stressed the importance of agricultural products in Africa and said it was "an area where the insurance industry has not yet been very successful in providing much needed coverage for livestock and standing crops."

But it was stressed that inhibiting factors which had to be resolved were lack of data on climatic conditions and types of losses which could occur. "In some areas weather conditions are such that they could result in catastrophic losses," said one delegate.

Delegates recommended the setting up

of Aviation Pools to ensure the retention of a reasonable proportion of Aviation premiums within the continent. An Arab delegate gave details of how the establishment of Pooling arrangements in the Aviation business in his area resulted in a substantial increase in retained premium income.

It was decided that credit insurance, well established in the developed countries, was essential for the developing economies of Africa. Information is to be obtained to enable decisions to be made on the form of cover which could be offered in Africa.

Delegates recognised that there would be an increasing demand for Personal Insurance. They also felt there was a need to develop all aspects of Loss Prevention for the benefit of the overall economy.

With the impending implementation of an African Third Party Motor Insurance Card delegates said it would be a great advantage if Motor Insurance laws were standardised in African countries and insurance policy standardised in a similar manner.

For insurance business to expand properly, it was felt unanimously that Exchange Control authorities should adopt a flexible approach to the movement of insurance premiums in Africa. □

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NORTHERN EUROPE → NIGERIA

new maintenance complex at Lagos Airport

A bold move to place Nigeria in the forefront of African airlines, plans have been drawn up to build a new aircraft maintenance and overhaul complex at Murtala Muhammed Airport.

A Canadian group of aviation consultants, Aviation Planning Services, has been retained to produce a master plan for the new facility capable of accommodating four Boeing 747's, a new hangar 300m long and 100m wide will be built.

This will be included in the first phase of the development plan scheduled for completion by 1992. Despite the size of the project, provision will be made for later expansion should this be required.

Expected to be the largest aircraft maintenance complex in Africa, the new project will include facilities for the complete overhaul of components and engines. The new facilities are expected to attract business from other African airlines which, like Nigerian Airways, at present contract for maintenance outside Africa.

The Nigerian move is seen in part as an endeavour to reduce dependence upon overseas servicing and to save on foreign exchange.

Rent-a-car for arrivals at Kotoka

Tourists and other passengers arriving at Kotoka International Airport can now rent a car or bus from "Speedway/Avis Rent-a-Car".

According to the tours manager all that a customer needs to do is to make a booking at the airport of embarkation and on arrival at Kotoka Airport he would be met by the hire car. The daily charge for a car is £35, for a bus £100.

New air link

The Gatwick Heathrow Airlink was inaugurated on 9 June with HRH the Prince of Wales flying as a passenger aboard the first of the inter-airport helicopter services, whose journey lasts just 15 minutes, thus by-passing more than an hour's drive.

The Royal Flight culminated a day of special celebration at Gatwick, for earlier in the morning Gatwick's £100 million development programme was officially declared complete.

The Gatwick Heathrow Airlink will operate 10 round trip services each day, with flights specifically timed to coincide with the morning and afternoon peak periods at both airports (see schedule attached). In a full day's operation, services will begin and end at Gatwick at 6.45 am and 9.15 pm respectively.

A single fare of £12 (50 per cent for children) will be charged for domestic passengers and travellers connecting between European flights. However, for

Fokker-VFW's key role in Africa

The key role which Fokker-VFW equipment has played for years in the development of Africa's communications is being continuously and significantly expanded.

In Senegal, latest country to join the F27 operators list, two of six Friendships on order have entered government service.

In Côte d'Ivoire two F28 Mk400s delivered last month have brought the country's F28 fleet to a total of five.

Opportunities offered by the choice of Fokker-VFW equipment for self-sufficiency in maintenance and in provision of crews in both cases have weighed heavily in purchasing decisions.

Fokker-VFW is for its part fully sympathetic to the desire for technological advance in countries developing aviation industries and the consequent need for skilled and thorough training, so assistance in these matters is accordingly given high priority in all negotiations.

Primary reason for the Senegalese government's choice of the F27 was the aircraft's versatility and ability to play virtually any role in the development of the country's communications.

Another factor was the steadily increasing degree of independence that choice of the F27 enabled Senegal to assume. To this end Senegal has embarked on a systematic programme of raising its technical capability by sending aircrew as well as airframe, electrical and avionics engineers to the Fokker-VFW plant in Holland for training, and for additional courses as necessary with Rolls-Royce and Dowty in the UK.

First trainees have completed their programmes and returned to Senegal.

A VFW-Fokker technical representative is based at Dakar and will stay there, by arrangement, for about eighteen months. The result of this intensive application to technical matters is rapid acquisition of aviation technology. One significant economic result will be saving of foreign

exchange by the handling of all F27 major checks in Senegal.

The two 44-seat aircraft recently delivered may be equipped with stretchers for air ambulance operations when necessary. Their immediate task is to help implement the government's aid programme following severe drought which has hit the country's agricultural industry.

The aircraft are being used to deliver urgently needed supplies to remote areas inland served by short strips with surfaces of sand or compacted rock.

In the Côte d'Ivoire successful operation of the Mk100s led last year to orders for three Mk4000 aircraft. The first is already in service. Of the two delivered last month, one is capable of head of state transport duties.

Côte d'Ivoire adopted the 85-seat Mk4000 for its increased capacity and for the greater power of the Rolls-Royce Mk55-15H engines. This power unit develops 9,900 lb. take off thrust and has a flat rating at 29,7°C, an increase of more than 6 per cent on a 40°C day compared with the Dash 15.

This represents an especially valuable power increase in hot climates. Combined with the greater lift of the Mk4000s extended wings, it enables the aircraft to operate with MTOW of 32,200 kg. from Côte d'Ivoire fields where no other jet is able to operate. This performance has brought new standards to the country's air transport system.

Another feature of the Mk4000 which makes it especially suitable for operation from rough and unpaved fields, is its engines' natural immunity from stone ingestion and its special under-fuselage protection.

Practical training in aircraft maintenance is being given by two Fokker-VFW engineers who have been based in the country for more than a year. There is also a new maintenance facility at Abidjan where all aircraft servicing will be handled.

certain categories of international passengers the Gatwick Heathrow Airlink will be offered at no extra charge.

The new service is operated by British Caledonian Airways with a 28-seat Sikorsky S-61N helicopter leased from the British Airports Authority. Technical support and flight deck crews are provided by British Airways Helicopters.

Ghana Airtours offers jet freighter

Ghana Airways' subsidiary, Airtours, now offers the first regular jet freighter — a Boeing 707-320C — from London to Accra. Payload potential is almost 40 tons.

Lufthansa to train Nigerian Airways

Lufthansa is planning to train Nigerian Airways' staff in traffic handling, cargo throughput and ticketing. Negotiations for the deal have reached an advanced stage,

and training should start soon in Frankfurt, where Lufthansa has a new training centre.

NAA increase airport fees

The Nigerian Airports Authority has now increased the airport fees. The increase was made by the authority because it was reportedly discovered that the fees currently paid were disproportionate to the services it renders and the facilities provided for the use of airlines at the ports.

Nigerians touring abroad are now to pay ₦5 each for every tour they make overseas.

Air Inter Gabon take on Islander

Air Inter Gabon has taken delivery of another Islander aircraft to operate on charter and scheduled routes. The aircraft was flown to Gabon from Britten-Norman's Benbridge plant in the UK by the airline's managing director.

commercial review

New containerized shipping line

A fully containerized Nigerian shipping line operating between the UK, Europe and Nigeria is starting this month as the result of a newly-formed partnership between a leading Northern Nigerian businessman, Alhaji Aminu Dantata, and the Walford Maritime Group.

The new line is to be known as Sea Dantainer Lines Ltd. and Walford Lines, part of the Walford Maritime Group, will act as general managing agents, UK port agents and loading brokers. It is intended to develop conventional services in parallel with the container service.

Loading at Cardiff and Antwerp, Dantainer offers 6-metre containers at quay to quay or door to quay lump sum rates with off-loading at Warri, where Dantainer is to have its own Customs-approved terminal. A door to door service including onward transit to Lagos and other Nigerian destinations will be using an associated company of Dantainer, Mainline Transport, which operates a fleet of custom-built container trailers.

Warri was chosen because it is well situated to operate a through delivery to the increasingly prosperous mid and northern states. The port is also less congested, well administered and its facilities will be further developed in the near future.

Six new berths and a container terminal are under construction and scheduled to be completed in the second half of 1979. Walfords are now well established there, having run a service to Warri for eighteen months.

Existing shipping services have hitherto concentrated on traditional markets of Lagos and Port Harcourt. However, it is becoming increasingly clear that the middle and northern states are, themselves, rapidly expanding markets. Dantainer has been created largely to provide a direct service to this growing market as well as to provide a viable alternative service for southern markets.

Special equipment for handling containers has been installed by Dantainer at Warri. Besides the offices and facilities at Warri there will be another office and inland terminal at Kano, the major commercial centre of the North.

New wrapping for UKWAL's cargo

The United Kingdom-West Africa Lines Joint Service have introduced pallet stretch wrapping for many of their cargoes. In the main these comprise carton packs, bags, small cases, drums and tea chests, each pallet load being destined for a single consignee.

The joint service commenced stretch wrapping palletised cargoes on an experimental basis early in 1976, using three Timperley Engineering Infra-Pak Rotarap stretch wrappers. Performance of stretch

wrapped pallets was excellent over a period. In the same period, the time taken to extend the pallets was reduced. Engineering supplied stretch wrappers, thus bringing the cost of machines to six.

Stretch wrapped pallets are quicker to load and discharge and take up considerably less space than do individual packages.

Nigeria sets the pace

Nigeria's leading hotels are among the best in UK interiors. One good example is the restaurant, bars and lounge areas of the Federal Palace Suites Hotel. Other areas have been individually furnished by Tavern Furnishing Ltd. The company, now established a 100% Nigerian sister company Tavern Furniture Ltd. (TAFUNI) to prepare for further major projects.

Some of these projects include the renovation schemes for Nigeria's new Kano Central Hotel and the extension to the Hill Station Hotel. Tavern Furnishing have also been awarded a furnishing programme for the Ministry of Works and Housing, Kaduna Lake Conference Centre, Kano State Government.

Future plans for the renovation of the design and furnishing of a conference centre and hotel at the University at Zaria and the renovation of the Lagos Airport Hotel.

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Commercial review

Adcoat expands fleet

Adcoat Air Cargo the all cargo airline specialising in weekly Split Charter flights to various destinations throughout West Africa with the exception of Nigeria are celebrating the end of their first year's operation with the purchase of their second aircraft.

In keeping with the principle that it is the most economically viable aircraft to operate their "milk run" style of operation throughout such cities as Freetown, Monrovia, Accra, Banjul, Nouakchott, Niamey, Dakar and Luanda. Adcoat have purchased another Britannia freighter, a model 253F.

New service Rouen-Warri

The Nigerian Obinyan Line which has been operating a regular service from Rouen to Lagos since last October, is adding a regular departure to Warri. The first departure on the new service was on the 15 June with the vessel "Concordia".

With a 15% rise in total traffic in April compared with the same month last year, traffic through the French port of Rouen continues to climb strongly this year. The total for the first four months of the year of 6,358,000 tonnes was 20.3% up on a similar period of 1977.

New shipping line Bordeaux-Apapa

Nigerian National Shipping Line (NNSL) and the Common Service Serving Armaments to West Africa (SCADUA) has just created a new regular line from Bordeaux to Apapa.

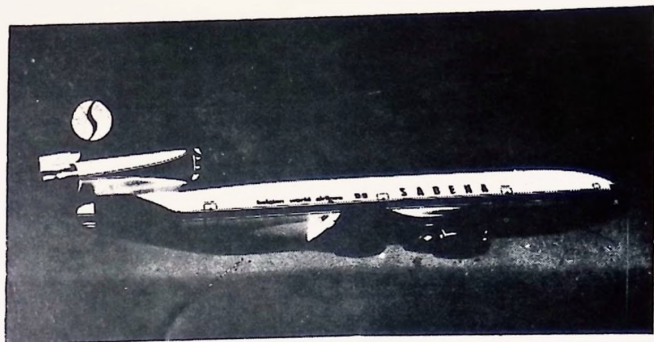
This new service will operate with an integral container-carrier loaded with containers of 7 metres, and will be able to ensure a complete turn round every 35 days.

Extension for Benin Railways

Benin Railways is to start its railway extension 650 km. north to Niamey in Niger. The route will cross the Niger River at Bodjeleali and go through the towns of Gaya and Dosso in Niger to rejoin the Niger River at the capital. It is expected to be complete in six years, and will result in the opening up of much of the hinterland of Benin and will improve movement of traffic and goods to and from Niger. The total cost is expected to be CFA Fr 50,000 m.

Morocco-Guinea air agreement

Morocco and Guinea have signed an air transport agreement after a visit of a delegation to Rabot led by the wife of the president of Guinea. The Moroccans will be training Guinean civil aviation personnel.



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Commercial review

Port cargo throughput Lagos up

Port cargo throughput achieved in April at Lagos Ports complex has been the best this year. It is also the highest throughput achieved since the existence of the entire complex.

During the month, the port achieved a throughput of 704,581 metric tonnes. The PA was able to achieve that feat following the decongestion of all the transit sheds by the Ports Decongestion Committee. In effect, it has done away with one of its major constraints.

10th ro-ro

Sailing for BFI

BFI Line's 50th Ro-Ro sailing between Northern Europe and Lagos was celebrated earlier this month in Antwerp on board 'ADMIRAL ATLANTIC' — the most recent of three specialist Ro-Ro ships built in Japan for Admiral Shipping of Oslo.

The vessel sailed from Sheerness for its maiden voyage on May Day in BFI colours. She discharged at Apapa fourteen days later, returning to Sheerness to load in readiness for the Line's 50th sailing on 28th May — via Antwerp.

In brief . . .

The Danish East Asiatic Company has just established a container service between Denmark and Nigeria with two containers of 19,400 tonnes. They will stop at six European ports before reaching Lagos. Leaving Lagos the ships will carry cocoa, palm oil and coffee.

The Liberian Government is to buy a presidential Boeing aircraft, for some \$2.5m. The purchase will be financed by a \$20m loan from the US bank Citibank, which is also financing a \$10m housing project already under way and a \$7.8m agricultural project.

The Sierra Leone Institution of Engineers and the Faculty of Engineering, Fowah Bay College is to host an International Conference on "Appropriate Technology in Rural Societies". Participants are expected to attend from Kenya, Tanzania, Canada, UK, USA, Sri Lanka, India, Nigeria, Ghana and Liberia.

A \$30m brewery is to be built at Imelu, Oyo State. The Managing Director of Sanmi Breweries Ltd said that when completed the brewery will produce 100,000 hecto-litres of beer yearly. 75% of production would be bottled, the rest canned.

The UK Government has given 252 text books worth D3,040 to the Gambia Co-operative Union.

The Ghana Water and Sewerage Corporation and TAHAL Consulting Engineering have completed plans for a Ø27m. well drilling project to be installed in the Eastern, Western, Central, Volta, Ashanti and Brong-Ahafa Regions. It is reported that it will be financed by the Ghana Government and the Federal Republic of Germany.

Longines, a Swiss watch firm has recently inaugurated two electronic displays designed especially for the African Football Cup which is to be held in Ghana. The display panels are controlled by a micro-computer whose programme makes it possible to indicate the composition of teams, the score, the names of those who scored and length of play.

The first African Regional Conference of International Commission on Irrigation and Drainage to be held in 1982 may be hosted in Nigeria. A five man adhoc committee has already been appointed to study proposals on the theme and venue of the conference.

A report in the New Nigerian claims that 1,741 people have died since February in Northern Nigeria as a result of Cerebro-Spinal-Meningitis (CSM).

Work on a \$150m. oil refinery at Victoria in Cameroon will start in September, it is claimed. The 1.5m. ton capacity refinery, in which South Kolza has invested heavily, will take up to three years to build.

Ghana and the USSR have agreed to enter into a long-term maritime agreement on merchant navigation.

The Ghanaian-Italian Petroleum Company (GHAIP) is studying ways of increasing the supply of petrol to meet the demand of the nations motorists. Feasibility studies are underway on the establishment of a bitumen plant and an engine and lubricating oil plant.

Nigeria's total crude oil production for the month of April stood at 1,693,102 barrels per day, a 10% increase over the output of March.

The April production figure is the highest on record since the beginning of this year.

Despite the fact that the Abidjan container terminal, which has been under construction since July last year, will commence service at the end of 1979, it is already foreseen that it will be saturated by 1982.

The autonomous port of Cotonou has just acquired a second tug the "Bopeffi" built by Ateliers Français de l'Ouest.

Cameroon Shipping Lines is to acquire two new polyardent ships in 1979 to replace the first units of the company, which will open a new regular service to the Mediterranean.

Witt and Busch (Shipyard) Ltd. has launched the first locally built vessel of the Nigerian Navy at Port Harcourt. The 40.24m vessel is a water barge with a capacity of 400,000 litres and is built according to the Navy's specifications.

Drought in early 1977 severely hit the Ivory Coast's 1977-78 coffee crop and has been one factor which has forced it to withdraw temporarily from the world coffee market according to official sources.

An Agro-Service Centre is to be established in Elemé as part of the Elemé Agricultural Development Centre to merge with the present Equatorial Guinea returns firm at Agbeta.

The Federal Government's N10m ultra-modern secretariat complex now under construction in Port Harcourt will be ready before June next year, at least eight months before schedule.

New appointments . . .

● Professor Ayo Agunsheye has been appointed Managing Director of the Henry Stephens Group, in succession to the late Chief Henry Fajemirokun.

● A Nigerian banker, Mr. C. C. Okafor, has been elected a Fellow of the Institute of Bankers in London.

● Mr. H. T. Durojaiye has been appointed Managing Director of Nigerian General Insurance Company Ltd. He succeeds Mr. J. A. Awoyirka, who retired in February. Until his appointment, Mr. Durojaiye was assistant general manager and lately acting manager director.

● Mr. Babatunde Lakanu, an executive pharmacist in May and Baker Nigeria Ltd. has been elected member of the British Institution of Marketing.

● Mr. Olayiwale Odukoya has been appointed Administrative Secretary of the Association of Advertising Productions in Nigeria — the professional body for Advertising Agencies in Nigeria.

● Mr. J. O. Toba has been appointed as the Managing Director of Haco Ltd. Haco is a cosmetic and manufacturing company.

● BP Nigeria Ltd. has announced the promotion of Mr. N. O. Farinde as the Deputy General Manager of the company.

● Chief Accountant, Mr. O. O. Oni, and The Head of Administration, Mr. E. C. Jibuike, have been appointed to the board of Mandilas Enterprises Ltd.

● Nigeria Tejir Textiles Ltd. in Ikeja has announced the promotion of Mr. Festus (Personnel and Public Relations).

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COMPANIES & CONTRACTS

A flight simulator has been ordered from the Netherlands by the Nigerian Federal Government. It will be installed at the Civil Aviation Training Centre at Zaria in 1980, the simulator will be used to train Nigerian pilots as well as students from other countries. The simulator features a six degree of freedom motion system as well as the latest computer generated image visual system. Ghana Airways captain Kwabena Safa recently became the first African student to complete a training course on the new Fokker F28 flight simulator at Delft in Holland.

Taysec Construction Ltd., a Ghanaian company in the Taylor Woodrow Group, has been awarded a contract worth about \$30,000 for the foundations and superstructure of a grinding mill at the Ghana Cement Works, Tema. The new mill is the second contract for Taysec at the Ghana Cement Works. The first was for a clinker storage shed. Construction is scheduled to take 11 months and consists partially of structural steel and partially reinforced concrete frames. Engineers for the project are Cowiconsult Ghana of Accra, and the quantity surveyors are G. A. Takyi & Partners of Accra. Taysec Construction is a joint-venture company between Taylor Woodrow International Ltd. and the Social Security Bank Ltd. of Ghana.

Simon-Greer Ltd of Newton-le-Willows, UK (a Simon Engineering company), has been awarded a contract by the Chiyoda Chemical Engineering and Construction Company of Yokohama, Japan, for the supply of wax moulding and packaging equipment to be installed at the new refinery of the Nigerian Petroleum Corporation at Kaduna, Nigeria. Valued at over £1 million, the contract involves the supply of two separate microfibre wax processing lines, each comprising molten wax depositing, cooling, cartoning and conveying systems, and all refrigeration services. The equipment is scheduled for delivery in mid-1979.

The FMG, Nigeria has approved the award of contracts worth \$20.7m for the supply and supervision of electrical equipment. Masehnenfabrik Ausberg Co will supply and supervise the intake and draft tube mechanical equipment for the Jabba Hydro electrical development at a cost of \$3,369,975. The contract for supply and delivery of gates, guides and hydraulically operated hoists for the Shiroro h/e project was awarded to Oy Tampella AB of Finland at a cost of \$1,876,302.

U. G. Closures and Plastics UK who have recently appointed I & O Ansbacher its agent for Sierra Leone, Liberia and Ghana has had an order for 28mm plain silver caps for Liberian gin and whisky. A second order has been placed by a Ghanaian distiller J D Atseku for 28m and 31.5m piffproof closures for spirits. Hungary has secured a \$1.6m. order from Ghana to provide dock cranes for two Ghanaian ports, according to reports from Budapest.

The Reiss Engineering Company Limited, has received an export order valued at around £120,000 for two identical steam systems, from Black Clawson International Ltd., of Newport. These are to be installed in conjunction with two newsprint machines being supplied by B.C.I. for the Calabar project of the Nigerian Newsprint Manufacturing Co. Ltd. The equipment is the latest Reiss cascade type, using special control systems to improve heat recovery from the condensate return to the boiler and to reduce cooling water requirements.

An order has been placed for 500 km of special furniture tubing in West Africa with Barton Tube Sales by the buying agents Meewood (Africa) Ltd. A contract worth \$1.11m for the first phases of the third Jumu Mosque at Sokoto was awarded to Northco Construction Co Ltd.

The Polish foreign trade company, Polimex Cekop, says it will be supplying machinery and equipment, assembly and training services worth \$5.5m for a woodworking plant at Ekole in Ondo State. The contract is with a new company, Nigerian Wood, made up of Polimex Cekop, the Polish trading company Dal and a group of Nigerian businessmen. Construction of the plant will start in "the near future" and it will handle 44,000 cu. m. of wood annually.

Major projects in Nigeria for the supply of perimeter lighting and electrical cables for Nguru Barracks, electrical fittings for the Baganda Conference Centre and University College Hospital extensions in Ibadan and most recently the supply of all electrical equipment for the Federal Government Housing project in Kano State have been negotiated and won by Grest Exports Ltd. and Alhaji Eji Lasisi one of Nigeria's largest electrical contractors and distributors of electrical engineering equipment.

E. H. Bental & Co. Ltd. have received three orders totalling in excess of £1m. The first of these orders has been valued at £300,000 for ten coffee dryers, destined for the Ivory Coast.

The Nigeria Air Force has awarded the contract for the construction of its air staff barracks in Makurdi, Benue State to two indigenous contractors Bagudu Construction Co Ltd and Femisco Structures Ltd.

The Nigerian Engineering Construction Company won the contract for design, supply, erection and testing delivery and commissioning of double circuit 132kv transmission lines worth \$5,610,970. The supply of power transformers totalling \$4,548,086 went to Polish, Korean and Finnish firms. The fifth contract for supply of 1,935 distribution transformers costing \$3,361,429 was awarded to Mitsubishi Japan, Rade Koncar of Zagreb and Minel Fabrika Transformatorate of Beograd.

Niger Delta Shipping Agencies have launched 10 new barges with a total capacity of 5,000 tonnes at Sapele. This brings the port's barge capacity to 7,500 tonnes and should double the port's ship-handling capacity.

The \$90m Anambra Motor Manufacturing Company Ltd (ANAMCO) Enugu, is to start production in 1979. The factory will be the first to produce Mercedes Benz trucks in Nigeria.

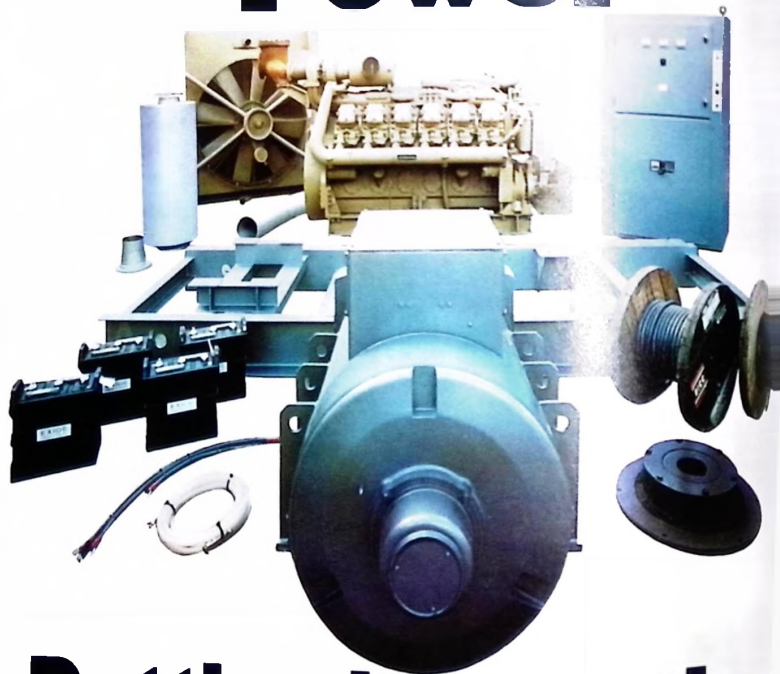
Six Dinosaur waste handling units on Leyland chassis have recently been imported into Nigeria from Powell Duffryn Engineering in the UK. To save freight, each vehicle carries pick-a-back a second container.

The vehicles will cut costs and time, as well as give a better refuse collection system in Ibadan. Previously refuse had been tipped into compounds and periodically shovelled into tipper lorries to be carried to waste disposal sites.

Now a 20 cu. in. container is left for filling at the refuse collection point. When full it is picked up by the Dinosaur, with the driver using controls in his cab to lift the container on to the vehicle, drive to the tipping site, empty the container and return it to its collecting point. This system is cleaner and more hygienic.



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The eighth part of a series by the author of "The A-Z of Industrial Salesmanship", and founder of the Institution of Sales Engineers, dedicated to all sales operations striving to achieve maximum results from their existing resources.

CONTROLLING PROSPECTS

INDING PROSPECTIVE customers in scratch is something few salesmen do, or do systematically which is wrong, because Prospecting is one of the best jobs the salesman has to do. The sales manager needs to be confident that each of his salesmen is doing enough prospecting, and doing it effectively; so that the prospects found will equal a good chance of being converted into customers due course.

Going back to Part three, we know that is a simple matter to calculate how many new prospects any salesman must find in order to achieve his new business target—once the salesman's performance ratios are known.

The calculations would look like this—
 New Business Target
 For the year \$40,000
 Average order value of a newly opened account in the first 12 months \$5,000
 Salesman needs to open \$5,000

—8 New Accounts during year to achieve New Business target.

The Salesman's New Business performance ratios for last quarter indicate that—

For every 5 First Calls he makes on new prospects, he succeeds in submitting 1 proposal (quotation).

And for every 4 proposals submitted on new prospects, he succeeds in opening 1 new account.

Thus, the number of New Prospects this salesman needs to find during the year, to stand a statistically certain chance of achieving his New Business target is—
 8 New Accounts x 5 x 4 = 160 New Prospects.

Assuming there are 10 working months in the year, allowing for holidays, this salesman needs to find 16 New Prospects each month.

In this way, the sales manager can calculate how many new prospects each of every one of his salesmen need to find in the month. Then all he has to do is to make sure they find them.

To do this, he could use a "Prospecting" form, on which the salesman has to list his new prospects for the month, plus information on best contact, potential business and the line of action which shows the sales manager he has carried out some research on the prospects before attempting to make first call.

A copy of the form is sent to HQ at the end of each month. The salesman retains the top copy to use when making his commitments for the following month.

I said at the beginning that prospecting was one of the easiest jobs the salesman has to do, yet the most neglected. So let's explain what makes it so easy.

Prospecting is divided into two stages—

- 1) Finding a Company that might buy
- 2) Checking that Company out to decide:—
 - a) Where to go
 - b) Who to see
 - c) What to do and say.

Using directories reading trade and local papers, attending trade association meetings can generate names of companies that might be considered prospects. Then a telephone call to each company (not to contact

the salesman might subsequently want to see) will establish more information.

Conclusion

What business is the company in?
 What equipment does it use?
 What problems might it have?
 Is business increasing or decreasing?
 Who is the best person to see?
 What is the best line of attack, and why?
 What visual aids and literature will be required?
 and so on, depending on the business the salesman is in.

Continued

PROSPECT LIST		Month	OCTOBER '77	Salesman	J. WATSON
COMPANY ADDRESS	TELEPHONE NUMBER	DECISION MAKER	POTENTIAL	BEST LINE OF ACTION AND REASON	
WEST BRAND CORP. BUSHROD ISLAND	21486	R. J. JENKINS WKS. MAN	500 H.B.V. COM.	DEMONSTRATE 47B MODEL	
SATCO BUSHROD ISLAND	22129	P. HARRISON PROD. MAN.	COMPRESSORS FOR M.O.D.	CHECK SPEC. AGST. OUR MODEL UG43 FOR BETTER DEAL	
OAC BUSHROD ISLAND	21010	H. WATKINS DEV. ENGR.		DESIGNING NEW PRESSURE SYSTEM	
NASSER & CO MONROVIA	22586	GRIAN JONES DIRECTOR	BUYING 100 AFS FROM 02B PER YEAR	GET HIM TO TRY A 47B FOR COMPARISON	
C.F.A.O. MONROVIA	21425	P. COCHRAN M/DIR	HAS CONTRACT FOR 24 RUSSIAN MACHINES	FIND OUT SPEC FOR HYDRAULICS	
GEPSCO BUSHROD ISLAND	22456	J. BRIGGS BUYER	QUOTING FOR SEWAGE WORKS FINHAM	DELIVERY PROBLEM WITH SHOOKS	
L.W.S.C. MONROVIA	22610		USES SHOOKS PUMPS	CHECK PLANNING REGISTER FOR DETAILS OF WORK GOV. ITALY	
HELOU BROS MONROVIA	21797	R. J. WOODS DIRECTOR	JUST BEEN APPROVED	MAKE SURE THEY KNOW ABOUT OUR A2 RANGE	



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ANGER

OFFICE AHEAD

Each year thousands of accidents occur in offices as a result of general carelessness and misuse of office equipment. This article, compiled by Air Products Ltd outlines the main danger areas in an office and suggests positive ways of reducing these accidents.

MOST OF us see the office as essentially a safe place, where the only thing that is likely to get hurt is our feelings.

It's a fallacy, and a dangerous one. Every year, there are thousands of serious accidents in offices. This means accidents which keep people off work for three or more days. The fact is that you can be crippled, seriously injured or even killed as easily in an office as anywhere else. You can do it by falling (the most common cause), by electrocuting yourself, by burning, by lifting heavy objects and in dozens of other ways.

It's difficult for anybody to see an office as potentially dangerous, in the same way as a coal mine or a building site. To an extent that's understandable. Offices can be very safe places indeed. What makes them dangerous is carelessness and misuse of equipment. What makes them safe is a continual awareness of possible hazards, and a determination to minimize them.

Safety isn't just the responsibility of managers, or the board of directors. Safety is your business, too.

What can you do about it? First, read this article thoroughly; its contents are important. Then check your own office area to see if it conforms to the recommendations. If not, make a note of the possible hazards and report them to your manager.

The next accident could happen to you.



What sort of accident?

Office accidents, surprisingly perhaps follow a similar pattern to those in industry. The risks don't seem to vary much between large and small offices, either.

Falls are the commonest cause of office injury, accounting for almost half of all accidents. Slightly more than half of these

falls occur on the stairs, the rest on the level.

Accidents caused by handling or lifting of goods are the next most numerous. The rest of the list includes accidents caused by people stepping on and striking against things, falling objects, machinery, transport, the use of hand tools, fire and electricity.

In fact, it's amazing the number of ways in which you can be injured in an office. The purpose of this article is to tell you what the risks are and how you can avoid them.

Office equipment — handle with care

Office equipment, such as photocopiers, provides the same hazards as office furniture. That is, it will probably have sharp edges and trailing electric cables. Like furniture it should be located away from walkways so that it doesn't provide a trip or collision hazard.



There are some machines which you are not allowed, by law, to operate unless you have trained in their use. Similarly the law in some countries does not allow people under 18 years of age to clean office machinery where this would expose them to risk of injury.

Falls and collisions — the trips you won't enjoy

Top of the office accidents charts, falls and collisions can be caused by many of the hazards we've already mentioned — untidiness, cluttered gangways, trailing cables and open drawers among them.

Stairs are the most frequent scenes of accidents. Don't wait for the accident to happen to you — report any broken

treads, turned up carpets, or other hazards. If you see any spilled liquid make sure it's cleaned up immediately. Always treat the stairs with respect, use the handrail (again, report it if you find it's faulty), don't carry heavy or bulky loads which block your vision or occupy both hands.



Walking around the office reading papers may look efficient, but it's downright dangerous; you can trip, collide with other people or equipment all too easily.



In hospitals, staff run only in the case of a cardiac arrest. We don't have many of those, so it's a good rule to walk, not run.

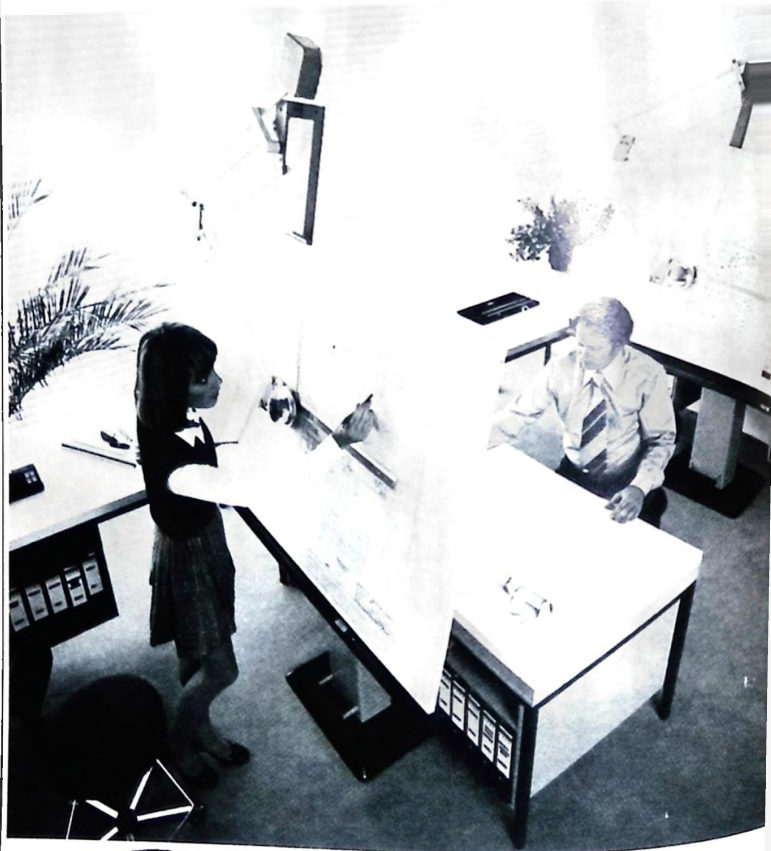
Lifting and carrying the safe way

It doesn't take a great weight to inflict a back injury that could plague you for the rest of your life. So if you do have to lift things, follow these simple rules.

- Let your legs, not your back, take the strain when you lift from low down.
- Bend your legs and lift with your back straight.
- Don't attempt to lift too much—get help rather than make a gallant attempt.

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Make sure you have a good firm grip before you lift or carry.

Make sure you can see where you are going. A fall while you're carrying a heavy weight is the surest way to serious injury.

Avoid lifting and carrying whenever possible by using a trolley or trolley.

Frightening furniture and fittings

Look around your office. Is there any furniture located where you can bump around without bumping into sharp corners of desks, shelves and so on? If not, suggest to your manager that certain items be relocated.

What about the filing cabinets? You should be able to open the drawers without blocking passageways. Are the top drawers full and the bottom ones empty? It often



happens that way — and it can be dangerous. The whole cabinet could fall over on top of you. So spread the load throughout the drawers, or transfer it to the lower drawers.

Make sure that *all* drawers are kept closed when not in use. At best you can tear clothing, at worst you can inflict a serious injury on yourself or someone else.



Metal furniture calls for particularly careful siting — often it has sharp and dangerous edges.

Are there any telephone or equipment cables snaking across the floor? They are particularly dangerous — trip over them and you can damage yourself and possibly valuable equipment. Talk to your manager about re-siting telephone jacks or power points if necessary.

Safety in tidyness

Being tidy doesn't necessarily mean being safe — but being untidy is certainly

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ce. In particular it can create a fire
rd.
eep all passages and stairs clear of
, and don't use them as temporary
age places for goods in transit,
anted furniture and so on. Keep litter
where they won't create a trip hazard.



Place litter in the waste paper basket —
don't throw it. Half the time you'll miss and
at the end of the day you'll leave behind an
unsightly and dangerous pile of rubbish on
the floor. Do not put broken glass in waste-
paper baskets unless there is no alternative.
If you must, wrap it up and mark it clearly:
"BROKEN GLASS".

Some office equipment may need
topping up with chemicals. Always read the
instructions first, and take care not to
spill the liquid as it may be corrosive.



If the chemical does get on your skin,
wash it off immediately with plenty of cold
water, and get medical treatment quickly.

If a machine breaks down, don't attempt
to repair it yourself. Report all faults to the
service mechanic via your normal report
procedure. This applies particularly where
a machine is electrically operated.

The same rules apply here as with all
other electrical appliances: switch off after
use, remove the plugs at night, don't tinker
with plugs, switches or cables.

Among the most dangerous pieces of
office 'equipment' are seemingly harmless
items like scissors, stapling machines,
knives and guillotines. They are probably
the most common cause of unreported
accidents and need treating with respect.

Fire — preventing it

The first point is to remember that a fire
needs three things — fuel, air and a source
of ignition. Eliminate any one of those ele-
ments and you eliminate the risk of fire.

There's not much you can do about
removing air — except to make sure that
containers of flammable liquids are kept
tightly closed. That also eliminates them as
a source of fuel.

Paperwork abounds in every office and
it's an ideal fuel for starting a fire, so put
waste-paper into the waste-paper basket.

Source of ignition? Cigarettes are a
common cause of fires — carelessly tossed
into a waste-paper basket, perched on the
edge of tables and forgotten. Use a proper
ashtray at all times.

Electrical faults are another source of
ignition. Remember the rules: switch off
after use, unplug at night, don't overload
the circuit with multiple plugs, report faults,
don't tinker.



Fire — dealing with it

On every floor there are detailed instruc-
tions about what to do in the event of fire.
Read these instructions soon — you won't
have time if a fire breaks out. Find out how
to give the alarm, where the fire exits are,
where the fire-fighting equipment is located
and how to use it.

If you notice any defects in the fire exit
doors, or see that they are being blocked or
obstructed in any way — report the matter
to your manager.



Keep informed

Familiarise yourself with safety instruc-
tions posted on the notice boards.

These include:

- Fire and first aid personnel details
- Extinguisher locations
- Resuscitator locations

Should you need to get in touch with the
ambulance service, police, fire brigade,
doctor or first aid services, the telephone
staff have details of telephone contacts.

Make sure that you are aware of the
emergency procedures.



Summing up

- Eliminate trip and collision hazards — open drawers, trailing cables, furniture and containers in walkways.
- Don't overload the top drawer of filing cabinets.
- Untidiness can cause accidents.
- Falls are the commonest cause of injury in offices — so look out for worn stair treads, turned-up carpet, spill liquid, faulty handrails and deal with or report them.
- Don't use chairs as ladders or steps.

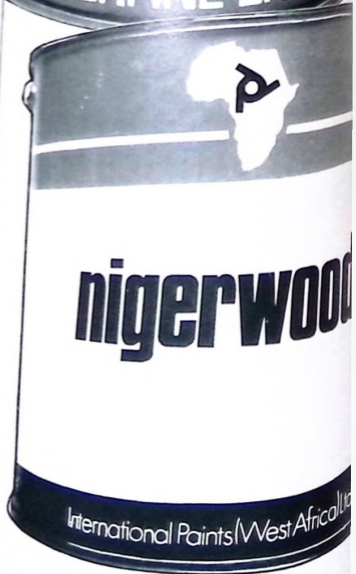


- Take care when lifting things.
- Don't tinker with office equipment, take care when topping up with chemicals.
- Carelessly scattered waste-paper unstoppered chemicals, cigarette ends and electrical faults can all cause fires.
- Know the correct procedure to follow in case of fire.
- Familiarise yourself with the safety information posted on the notice boards.
- TAKE ACTION: IF YOU SEE ANY POSSIBLE HAZARDS, REPORT THEM TO YOUR MANAGER.



AFRICA'S THREE

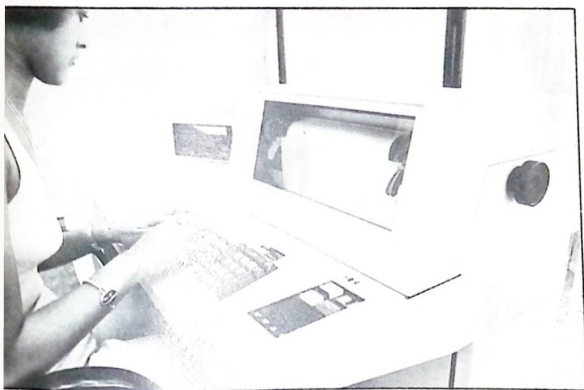
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WORD MANIPULATION



The IBM word processor is based on an IBM System/32 computer with the addition of a word processing program. In fact, extra System/32 features such as an upper and lower case keyboard and 3-line screen, as well as an optional magnetic card unit, the IBM 5231

The word processing revolution has begun, and in this article a special correspondent looks at word processors and their applications

WORD PROCESSING — the phrase used to describe the process whereby words are composed, manipulated, corrected and circulated — is gradually coming to be accepted by the (potential) user base. But what is the user base? Generally speaking it consists of typists. Until now, typists have had to adjust themselves to the intricacies and refinements of the electric typewriter, even though it must be acknowledged that the manual typewriter will be with us for many years to come.

So why should anyone bother with bringing strange high powered word processors into the office and foisting them onto a group of suspicious and worried typists? The simple answer is efficiency, while others are cleanliness, quietness of operation, speed, long-term economies and, last but not least, high standards of print production which in its turn bring more prestige for the company.

Improving the system

The first 'word processors' were really automatic typewriters, or typewriters which could remember what the typist had put in to the machine through the keyboard. The text was usually stored on punched paper tape; when the typist made her rough draft, a paper tape record was simultaneously made. This enabled the draft to be checked for errors and amend-

ments by herself and the author: replaying the tape then enabled these to be inserted to produce error free copy.

After this there came a proliferation of systems with different storage media: the magnetic card (literally a sheet of card coated with a magnetic material on which the typed text is encoded); magnetic tape cassette (similar to audit cassettes); and the floppy disc or diskette (a flexible disc coated with a magnetic substance for storing the data, about the size of a 45 rpm record). Large word processing systems today actually use the full size discs that

are associated more normally with traditional computer systems.

With these 'second generation' systems, the way that word processing works is that the typist produces her first draft, correcting any errors she makes by overtyping with the right characters—the electronic logic does all the necessary work to record the amendments in the storage medium. Thus on replaying to obtain the final copy, only clean error-free letters, reports, files, circulars, memos, etc are printed.

It can thus be seen how this type of system lends itself to the production of, for example, standard letters (where only the name, address and other pertinent information needs to be inserted at relevant gaps in the replaying of the storage medium), circulars and reminder notices. These systems are, for example, well suited to the demands of a thriving solicitor's practice.

Third generation system

However, what we are seeing today is the emergence of the 'third generation' system: a unit based on a visual display and typewriter-like keyboard with associated logic, storage medium and fast printer. These systems can be 'stand-alone' or what are known as shared logic configurations — that is, a number of workstations linked to a central controller. The workstations themselves are usually just the display (which is like a television screen) and the keyboard — the actual printers can then be located some distance away, for example in separate room, to add to the quietness of the 'typing' pool!

Although there are now several manufacturers within the USA and Europe who are producing shared logic systems (Wordplex, Logica, Philips, Siemens, **Continued**

The work station for the new Wang Word Processors is an alternative, compact, desk-top console housing an 80 character by on-line CRT display and an extended, typewriter style keyboard. Operators need only minimal training—most routines and functions are summoned and controlled by touching a single key



used
, Digital Equipment Corporation and
type, for example), the market has
really take off. A major reason for
concerns IBM: the giant organisation
he undisputed leadership in the office
computer fields. It has the largest
lled base of electric typewriters and
nd generation word processing
ms, and its prowess in the marketing
quipment is envied by most companies.

is generally acknowledged that the
ket for shared logic systems will open
when IBM decides to announce a full-
wn shared logic system. To date the
pany has really only hinted at what
ducts it has in store; no-one of course
knows when IBM will move. But the
cket is vast and it is unlikely that we will
the demise of any company now in the
sines.

Companies in word processing with an
ablished presence in West Africa include
M, Wang, Rank Xerox, Sperry Rem-
gton, Olympia, Adler and Philips. It is
never doubtful that there is potential to
: any introduction to the market by
ese firms of a shared logic system — it is
ill in many ways regarded as too
stigmatic by a great many organisations,
ut this is not to say that such concerns are
ot carrying out secret trials.

Example of trial use

One company which did carry out trials
on a shared logic system is the research
and development department of Fisons
Pharmaceutical Division in the UK: follow-
ing what has been claimed as the most
important trial of computer aided typing
ever carried out in Britain, the company
found that the average productivity gain
over conventional typewriters was 127%.
The results have clear implications for
other organisations with bulk typing re-
quirements.

Fisons Pharmaceutical Division
develops and manufactures ethical drugs
and over-the-counter medicines, and is the
fastest growing section of the £250 million
Fisons Group with sales of some £60 mil-
lion.

In support of its primary task of
discovering and developing new medicines,
the R&D centre (at Loughborough, UK)
has to produce a large volume of experi-
mental data and reports, mostly
typewritten, to ensure the efficiency and
safety of new drugs and to demonstrate
that the complex requirements of health
authorities throughout the world are met.

The evaluation of modern computer-
aided, or shared logic, typing was
undertaken, or shared logic, typing and
checking of reports could be speeded by
suitable equipment which included
electronic editing and storage facilities. If
the time taken by a given number of staff to
produce registration submissions could be
reduced, it might be possible to obtain
earlier market entry. Further advantages
were foreseen in the reduction of frustrating
retyping and an improvement in the quality

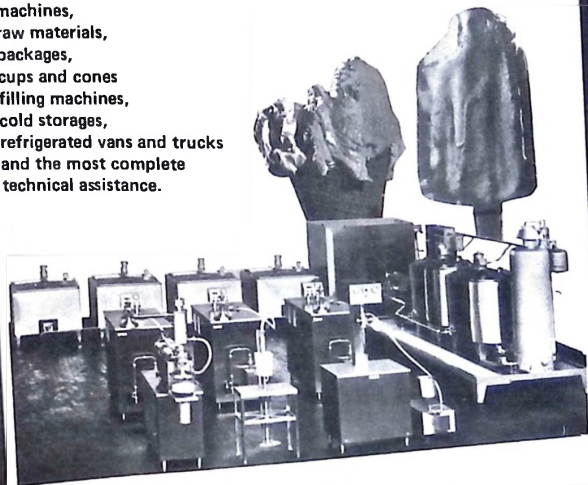
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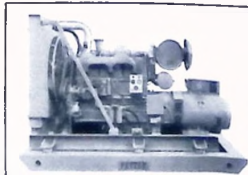
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In over 140 countries throughout the world, Petter Power Generation are putting power where it's needed. In hospitals, in mines, on construction sites, in factories and on farms, wherever electricity is vital, and there's a need for a reliable and economic power source.

Recognised as one of the world's leading manufacturers of high performance generating equipment, Petter Power Generation sets are engineered to exacting standards and are available in a broad power range from 1 - 1000 kVA. Comprehensive training programmes are provided, to familiarise customers with the equipment and ensure correct operation in the field.

Great care is also taken to match customers' existing equipment. Petter's world-wide sales and service network provide speedy attention and spares availability, should it ever be needed.



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WATR 3

Hawker Siddeley Group supplies mechanical, and electrical equipment with world-wide sales and service.

consistency in style of the finished

though these conceptual advantages could be obtained in theory, no field tests had been carried out which met Fisons research team's requirements.

While the typewriter had experience of magnetic card typewriters, it was considered that their disadvantages (for example, no means of displaying text prior to print-out and the impossibility of typing new work while printing) could be overcome by using a shared logic system. A panel was set up to compare the equipment available on the market and after a detailed investigation, it was decided to undertake a six-month assessment of Wordplex 7, a system developed by Wordplex Ltd.



The IBM Office System 6 is an advanced range of products providing word processing and information processing capabilities.

The main aim of the trial was to compare the effects of shared logic screen typing and conventional typing on the productivity of four typists.

The four girls had their work measured over four to seven weeks on conventional equipment, followed by a trial of between six and 12 weeks on the Wordplex 7 (a system that can be expanded for up to 24 typists). Each girl sits at a conventional keyboard with her copy appearing on a screen in front of her. The workstations are linked to a central microcomputer and can access massive electronic document storage files; printing of typed and



Wordplex 7 workstations at Fisons Pharmaceutical Division's R&D department where a six-month evaluation of computer-aided typing has shown an average productivity gain of 127%

corrected work from the screens is by high speed printer at up to 600 words per minute.

The method used for the trial was to measure productivity of the typists before and after installation of the Wordplex equipment, using as an index the number of lines of text per hour produced and returned to authors for amendment or final approved text. A daily log was kept to assess the technical performance of the equipment: in seven months, though faults occurred a total of 10 times (which were corrected by the supervisor within five to 10 minutes) there were no total failures which led to the equipment being out of service for long periods.

The results

The productivity of all four typists improved on average by 127% when they transferred to Wordplex equipment. Indeed in two cases where figures of 186% and 224% were recorded. Fisons considered that the increases were "fairly typical of

what one might expect in a routine typing situation".

What is perhaps of particular importance is the sociological aspect: in spite of the typists' lack of familiarity with the technology and the problems of initial commissioning, there was a noted change in attitude of both authors and Departmental secretaries from scepticism and mild hostility towards the system to one of increasing and intelligent use of its capabilities.

The essential criteria that Fisons used for comparing the characteristics of the different typing systems were: availability of scientific character set; availability of superscript/subscript facility; ease of use and adequacy of cursor; degree of visual match between keyboard, screen and printer characters; simplicity and comprehensiveness of functional control including underlining, deleting, merging, justification, speed and ease of recall; ease of bringing separate jobs together to form a single new job, ie creating one document out of several jobs; adequacy of size of disc store; output quality; maintenance/service arrangements; experience of manufacturer in shared logic videotyping; and redundancy of equipment including the ability to use part of the system in the event of a central processor failure.

Desirable criteria specified by Fisons included acceptability of keyboard to operator; ease of printer control; ease of overall control of system by the supervisor; adequacy of "housekeeping" (for example, disc tidy, security copying, statistics collection); adequacy and availability of computer generated instructions and prompts to operator via the screen; method of dealing with wide formats; and comprehensiveness of operator training.

In conclusion it can be said that the word processing revolution has started, but its full potential probably will not be realised until the 1980s when we will begin to see the emergence of the fully automated and totally integrated electronic office. That is not science fiction.

Wang Electronic's new System 10A word processor is a stand-alone, CRT and printer based system that shares many of the advanced features of the multi-station System 20 and 30 processor





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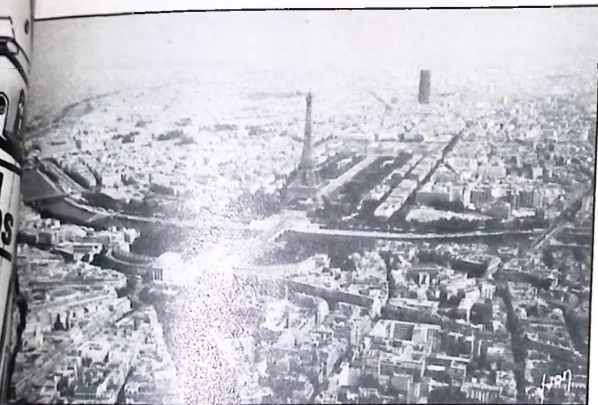
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DESTINATION PARIS



An aerial view of Paris with the Chatelet Palace and the Eiffel Tower in the foreground.

Hints for a businessman's first trip to Paris

PARIS IS many things to many people and new visitors reach the city without some pre-conceived notion of what it will be like. Paris in the Spring, the Latin Quarter, Montmartre, the turbulent student life of the Sorbonne, Bastille day parades, new tower blocks along the Seine. Paris is not one of these categories; but something of all of them.

For the businessman, the city begins out in the suburbs at the two main airports, Charles de Gaulle to the north, and Orly to the south, both efficient, impersonal and spotlessly clean.

The bare concrete decor at Charles de Gaulle can seem somewhat stark and getting from the arrival "satellites" through the customs barriers is a confusing business. Escalators run up and down on all sides, the signposts are muddled and it is easy to get lost.

Airport to Paris transport links good

Once you do find your way out, transport links with Paris are good, and this applies to Orly too. Bus or train every fifteen minutes to the city centre, at 14frs. axis, easy to find at airports except perhaps in the rush hours (8am to 9am and 3pm to 7pm) are 50fr plus.

The journey by road or rail is a short 1½ hour, and for the most part uninspiring. Suddenly, you get a glimpse of the arch of Sacré Coeur high on the hill of Montmartre, or a vista of city roofs

dominated by the Eiffel Tower, and minutes later you are there.

Where to stay

So, where do you stay?

The Charles de Gaulle airport coach actually pulls into a terminal building underneath the Concorde Hotel, which is modern and slick, like the Hilton, Sheraton and similar modern hotels. Most of these, like the Concorde, are on the edge of the

city's centre, and if you want something more traditional in the heart of Paris, there is a wide choice.

The Crillon, the George V, the Plaza Athénée and the Ritz are among the world's most famous hotels and their prices are sky high. They all have style and elegance and their clientele includes heads of state, top business leaders and show business personalities.

More modern hotels in town include the Sofitel-Bourbon just behind the National Assembly, the Inter-Continental near the Place Vendôme and the newly modernised Grand Hotel near the Opera.

For the rest, Paris hotels are in every category. All hotels, no matter how dear, must display room prices and service charges, and you should never pay more than the figure displayed on a card, usually on the back of the hotel room door.

Book well in advance

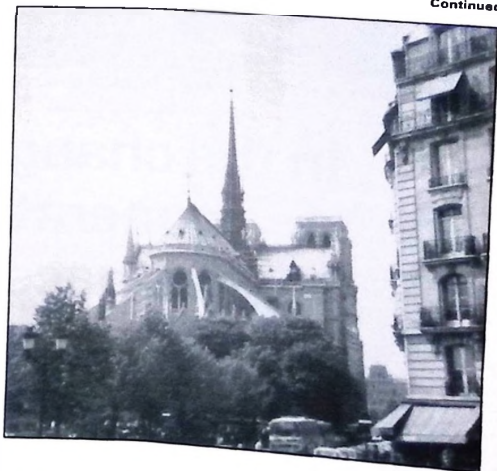
It is as well to book in advance, especially in high summer and around Easter (Paris in the Spring attracts the world's romantics) and also during weeks of major trade fairs like the motorshow.

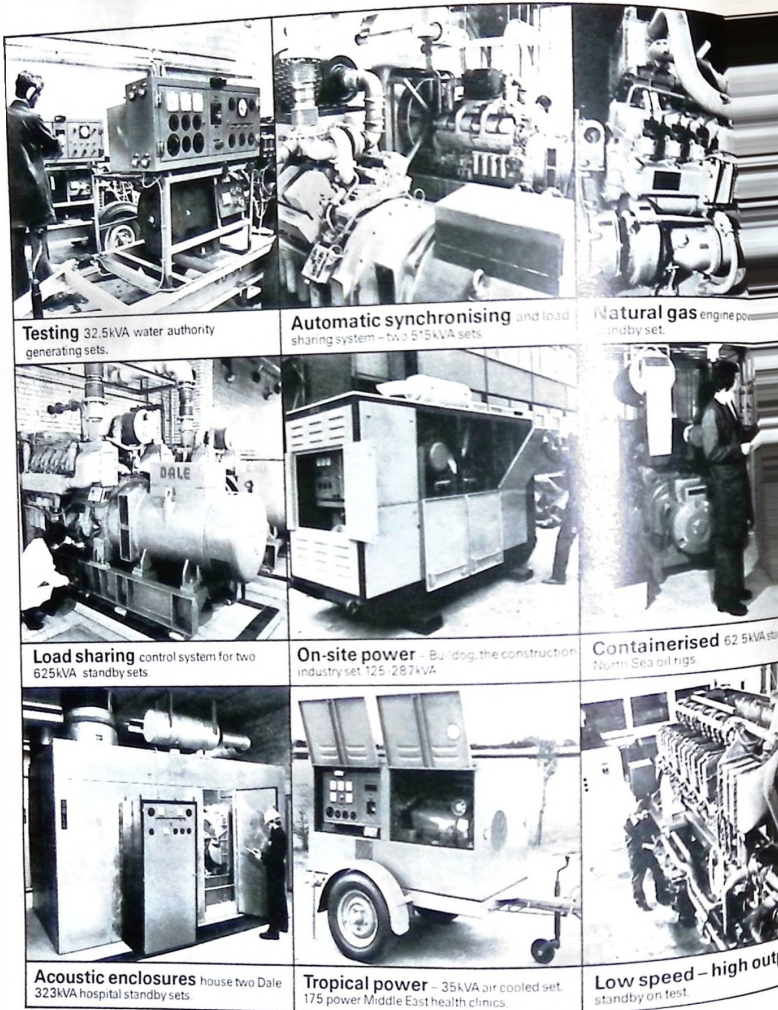
Breakfast, especially in modest hotels is served in your room and is always Continental (rolls, croissants and coffee). The price may be included but is sometimes extra. The card on the back of the door will tell you.

Don't worry if you can only find a hard bolster on the bed. Pillows are always hidden away in the cupboards, though no-

Continued

A view of the back of Notre Dame cathedral

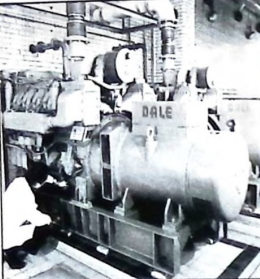




Testing 32.5kVA water authority generating sets.

Automatic synchronising and load sharing system - two 515kVA sets

Natural gas engine power standby set.



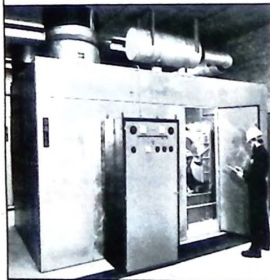
Load sharing control system for two 625kVA standby sets



On-site power Bulldog, the construction industry set 125-287kVA



Containerised 62.5kVA standby set North Sea oil rigs.



Acoustic enclosures house two Dale 325kVA hospital standby sets.



Tropical power - 35kVA air cooled set. 175 power Middle East health clinics.



Low speed - high output standby on test

In the changing world of generating sets, the pacemakers

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Grams: Daletric Filey.
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Dale Electric Skandinaviska AB



ued
tells you. If you don't look for them,
I wake up with a stiff neck!

"real" Paris — also cheaper

Prices at the Crillon-Ritz level start at
for a night for a single room, but outside
luxury class you can get double rooms
for 150fr. If you want a slice of "real"
Paris, and not an international hotel, try
the area off the Boulevard St. Germain on
the Left Bank and around the Place de la
Boulogne.

In these areas are many cheaper
restaurants and "terrasses" where you sit
and enjoy the Parisian pastime of just
watching the rest of the world go by.

One of the most famous terrasses is at
Café des Deux Magots in St. Germain des Pres,
especially on Sunday mornings when it is
crowded with artists, writers and actors.
They say if you sit long enough at the
table of the Café de la Paix near the
opera, you are bound to see how one you
know pass by.

You pay dear for the pleasure of a
coffee here, and on the Champs Elysees is
the Mr and Whisky and "sandwiches" stand to
be astronomical.

Transportation is easy

Travelling round the city is easy and the
Metro, the underground railway, is fast and
frequent (1st class coaches are no more
comfortable than second, but less

*The Eiffel
Tower —
the most
notable
landmark
of Paris*



crowded). A "carnet" or bunch of tickets
costs 12fr for ten voyages. They can also
be used on the buses.

Taxis are expensive and usually ignore
you when it is raining. Taxi drivers know
their city well and can find even the
smallest side street. They are often
reluctant to take you on a short journey (to
a station) if they think they can get
someone to go on a long trip (to an
airport). Legally they are not supposed to
do this. But they do.

All taxis have meters and beware of

drivers who say they forgot to switch the
meter on. If there's nothing on the meter,
the law says that's what you pay: nothing.
Some taxi drivers have signs up asking you
not to smoke. It is usual to refrain from
smoking when you see "ne pas fumer
s.v.p." (please don't smoke). You can't
smoke on the buses or the Metro, but you
can smoke on the station platform before
the train comes in.

Beware in the dark

After dark, buses and Metros get
scarcer. Late night, watch out for muggers
in the long Metro corridors. The moving
pavement at the Chatelet station is now
police patrolled as muggers have "rushed"
their victims of their wallets and purses, on
this stairway.

While violence is a problem, keep to the
well-lit areas and don't go looking for
trouble, and you are unlikely to be
bothered.

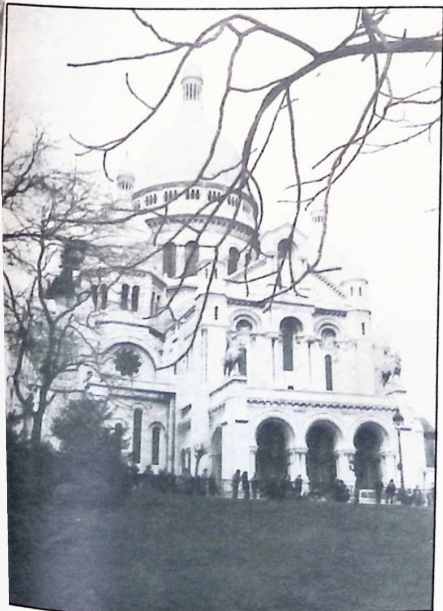
Where to eat?

Where to eat in Paris? Anywhere, and
all restaurants have a price list outside (to
which you must add 10-15 per cent service
charge). There is no cover charge any
more.

Take French business colleagues to the
best and its Grand Vefour in the Palais
Royal, the Tour d'Argent with its
breathtaking view of Notre Dame
cathedral or Maxim's where the
atmosphere is as important as the food.

No French guest would refuse Vivarois
in the elegant 16th district on the Avenue
Victor Hugo, or Lasserre, on the Champs
Elysees. You need to book tables in
advance and prices are high. None of these
will leave you change from 250fr a head for
a good meal.

*The church
of Sacré
Coeur,
perched
high on
top of
Montmartre*



COMPUTER REVOLUTION

RIMAX AN INDIGENOUS COMPUTER HAS NOW ARRIVED. YOU NOW HAVE AN ALTERNATIVE COMPUTER SYSTEM

- ★ THERE IS NOW A COMPUTER CALLED **RIMAX**
- ★ IT COMES IN MODELS 9010, 9040, 9060.
- ★ **RIMAX** CAN MATCH THE MOST POWERFUL COMPUTER SYSTEM IN THE WORLD.
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1	2	3	4	5
You're in a jam. Contact RIMAX for advice and immediate response in any of the following areas:	1. Rent of Computers 2. Purchase of Computers 3. Training Computer Personnel 4. Management Consultancy	Are you concerned about "programmers"? We produce 2,000 programs every year.	Are you concerned about maintenance? You will have an engineer for every system you buy or rent. Because we also produce them.	Are you concerned about price? You will have an office in every state in Nigeria. Do you need...

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Computer aided design. Production control.

Transaction processing.

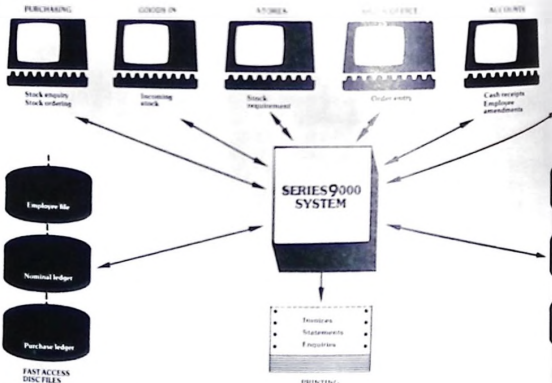
INFORMATION handling. Pensions.

Payroll. Teaching systems. Multi-access BASIC.

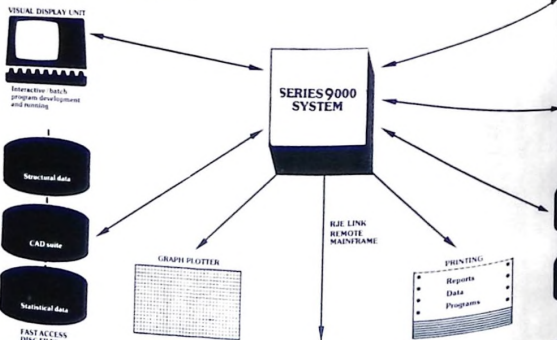
Message switching. Hospital patient records. Laboratory data acquisition.

Air traffic control. Satellite check-out.

A typical commercial configuration



A scientific / C.A.D. system



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BRANCHES -
LAGOS
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Lagos

SURULERE
6 Adediyaye Street
Tajuosha, Yaba
Lagos

IKEJA
10 Showunolu Street
Off Ogba Road, Ikeja

BENIN
142, 2nd East
Circular Road
Benin City

KADUNA
16, K...

cheaper are classic restaurants, popular French executives, like Drouant on Right Bank and Allard on the Left Bank. Late at night, you end up in Les Folies, the former produce market, for a bowl of onion soup at the Pied de Cochon. Businessmen in a hurry can get good, busy meals at the average bistro for as little as 30fr.

Choice of night life

The choice of night life is bewildering and the stranger to town is well-advised to ignore the taxi driver's advice of "an amusing little place" and head for the Lido, the Moulin Rouge, the Casino de Paris or the Folies Bergeres for big shows. Smaller nightclubs, without expensive meals, abound. One of the wittiest international clubs is the Crazy Horse.

Don't be persuaded into variety clubs, unless your French is very fluent. Apart from the "girls" there is also a good stand-up comic, and you give over trying to work out why he is as funny as your French friends think.

Paris has everything for shopping

For shopping, Paris has everything from luxury to rubbish. You can get most things you want from the big department stores like Au Printemps and Galeries Lafayette.

These are on the Grand Boulevards, and easy to find. For the luxury shops, the Avenue Victor Hugo and the Faubourg St. Honoré, near the Presidential Elysee Palace have wide choices. Paris fashion shops tend to be dotted about all over the place, and your hotel concierge will have their addresses.

Advice on French business practice

Most Frenchmen speak French and will not speak anything else unless they have to - even when they can! Brush up your French. You will not impress them with informality. Never use first names, unless asked to, and then be guided by how often

FACT SHEET

Entry/Exit Information

Le Bourget, Tel: 833-0590 and 208-98 90
Charles de Gaulle airport, Roissy-en-France. Tel. 862-2280
Orly Airport Tel. 587.5141 and 707.8555

No airport charges

Local Transportation

Airport bus/train to centre. Taxis and chauffeur-driven luxury cars available.

Departure Information

Coach departures: Aerogare des Invalides (for Orly and Le Bourget) Porte Maillot, (for Charles de Gaulle).

Train departures for airports: Gare du Nord (Charles de Gaulle)

Gare de Luxembourg (Orly).

All check-in facilities at airports.

TRAVEL & TOURIST INFORMATION

France Welcome bureau. Champs Elysees (well signposted)

Wagon-Lits Cooks, Place de la Madeleine Tel. 360.3320

Automobile Rentals

Hertz

EuropCars

Mattei

RESTAURANTS:

Grand Vefour, 17 rue Beaujolais Tel. 742.58.97

Tour d'Argent, 15 quai Tournelle Tel. 033.23.31

Maxim's, 3 rue Royale Tel. 265.27.94

Lasserre, 17 Avenue Franklin D Roosevelt Tel. 359.53.43

Vivarois, 192 Avenue Victor Hugo Tel. 504.04.31

Allard, 1 rue Eperon Tel. 326.48.23

Drouant, Place Gaillon Tel. 073.53.72

Pied de Cochon, 6 rue Coquilliere Tel. 236.11.75

Auberge du Vert-Galant, 42 quai des Orfevres Tel. 326.83.68

Prunier, 9 rue Duphot Tel. 260.36.04

Fauquet's, 99 Champs Elysees Tel. 723.70.60

Pre Catelan, Bois de Boulogne Tel. 288.05.60

SHOPS (Tuesday-Saturday 0900-1830hrs). Many closed all day Monday.

Antique Markets: Village Suisse (near Eiffel Tower) open Thurs through Monday: Flea Market, Porte Champerret (Sat-Sun-Mon). Laliq, rue Royale, Glass.

La Maison de Blanc, place de l'Opera and Avenue Victor Hugo, Linen

Galeries Lafayette, Boulevard des Italiens and Au Printemps, Everything.

Chanel, rue Cambon, Perfume, Couture

Yves St. Laurent Left Bank, rue de Sevres, Couture

Nina Ricci, rue des Capucines, Couture, Perfume

Charles Jourdan, rue St Honore, Shoes

Pinet, Boulevard des Capucines, Shoes

Morabito, Place Vendome, Handbags

they do it. They are very formal and you will have to shake a lot of hands. It's better to shake everyone's hand than leave anyone out.

They like punctuality and long lunches, although there is a trend now to curtail them. If your lunch guests shows no signs of hurrying, don't hurry him.

Don't expect to meet a business colleague's family. If you do it will be in a restaurant and seldom if ever at home. The French love talking politics and are usually well-informed on the subject. They always criticise the party they vote for, so don't agree too quickly.

One subject is taboo: the 1939-45 war. Psychological wounds of that era have never healed, and you will be wise to steer clear of talking about those times.

The Place de la Concorde at night



First of the fine Piper airplanes for '78.

1. Cheyenne III. All-new flagship of the Piper fleet. Six/ten place turboprop with Pratt & Whitney PT6A-41 680 shp turbines. 301 kt cruise, range to 2100 nautical miles with reserves. Efficient T-tail design. Fastest in its class.

2. Cheyenne II. Corporate turboprop unmatched for value. 620 shp Pratt & Whitney PT6A-28 turbines. Luxurious six/eight place seating. Outstanding payload. Cruise speed to 283 kts, range to 1510 nautical miles.

3. Cheyenne I. Brand new six/seven place turboprop with 500 shp Pratt & Whitney PT6A-11 turbines. Exceptionally economical to own and operate. The lowest price turboprop in the world. Cruise 252 kts. Range of 1085 nautical miles can be extended to 1400 nm with optional tip tanks.

4. Chieftain. Luxurious six/ten place executive aircraft that outsells them all. 350 hp turbocharged engines with counter-rotating props. Cruise speed to 221 kts, range to 950 nm. Stunning new interior decor.

5. Navajo C/R. Six/eight place executive twin with spacious, quiet cabin with rich new furnishings. Counter-rotating props for high altitude. Turbocharged 325 hp engines. Cruise speed to 220 kts, range to over 1000 nm.

6. Navajo. The affordable six/eight place cabin class alternative to the medium twins. Superb comfort, wide center aisle. 310 hp turbocharged engines. Cruise speed to 215 kts, range to more than 1050 nautical miles.

7. Turbo Aztec F. With automatic, full-time turbocharging, Aztec maintains full take-off power to 18,000 feet, easily tops most weather. Cruise speed to 210 kts, range to 835 nm, with option of range to 1145 nm.

Here's the exciting new line-up of 1978 Piper airplanes—from the best in trainers to your choice of three great turboprop executive aircraft. Want to pay special attention to these all-new models:
• Piper Tomahawk • Piper Brave 375 • Piper Lance II and Turbo Lance II • Piper Cheyenne I, Cheyenne II and Cheyenne III • Piper Dakota • Piper Seminole

Aztec F. Legendary 6-place executive twin with outstanding handling characteristics. 250 hp normally aspirated engines. Cruise speed to 176 kts, range to 985 nm standard, to 1320 nm with tip tanks.

8. Seneca II. By far the world's most popular turbocharged, six/seven place twin. Available with conference seating and extended range. Superb intermediate high altitude performance. Cruise speed to 178 kts, range with optional tanks 880 nm.

9. Seminole. Twin-engine flying on a single-engine budget from the world's largest manufacturer of twins. Advanced technology T-tail, counter-rotating propellers, tapered wings. Cruise speed to 162 kts. Ideal twin-engine trainer or "step-up" twin.

10. Turbo Lance II. Popular six/seven place retractable, now T-tailed for more efficient, smoother flying, with turbocharged 300 hp engine for excellent over-weather performance to 20,000 ft. Cruise speed to 175 kts; range to 815 nm. Conference seating available.

11. Lance II. T-tailed for more efficient, smoother flying, six/seven place, 300 hp and retractable gear. Roomiest retractable in its class, with conference seating available. Priced well below the competition. Cruise speed to 158 kts, range to 864 nm.

12. Cherokee Six 300. Powerful 300 hp station wagon of the air; six/seven place, with conference-style seating and air conditioning available. Two big passenger doors, two large luggage areas. Aerodynamic refinement! Improves speed and range for '78. **Cherokee Six 260.** The perfect solution when you want six/seven place seating with maximum operating economy. Lively 260 hp engine, with speed and range substantially increased. Rich new interior decor.

13. Turbo Arrow III. Four place retractable with long span, semi-tapered wing and 200 hp turbocharged engine. Constant speed to smoothest air above weather. Cruise speed to 172 kts, range to 860 nm.

14. Arrow III. Best selling engine medium retractable wing span, semi-tapered wing. Roomy four place with exceptional economy. Cruise speed to 145 kts, range to 980 nm.

15. Dakota. Piper's new workhorse. With a remarkable load of 1366 lbs., it takes off on Rugged Lycoming 235 hp engines 100 octane fuel.

16. Archer II. Most popular class, now with increased speed and longer range. Long span, semi-tapered wing means outstanding performance. Roomy four place with exceptional useful load. 180 hp.

17. Warrior II. Now even longer range. With 160 hp engine, 100/130 octane aviation fuel, long span, semi-tapered wing for cruise control. Four place, with ample luggage. Ideal first airplane.

18. Tomahawk. First all-new in 30 years. Design features high wing, efficient T-tail, sweeping visibility, two big entrance doors, access to all systems for check-out, servicing. Two roomy seats in cockpit. 112 hp.

19. Super Cub. Popular and STOL-like utility aircraft. Landing takes off almost anywhere. Perfect for endless jobs, worldwide. Can operate for long periods far from maintenance base. 150 hp.

20. Brave 375. New, higher performance model of the popular Brave. Low take-off, agricultural applicator who maintains payload, shorter take-off, faster climb, 375 hp, 2285 lb. useful load, 5 cu. ft. hopper and three-bladed propeller standard.

21. Brave 300. New general aviation applicator aircraft with 300 hp, 30 or 38 cu. ft. hopper, two-bladed prop. High to low speed, liquid and dry dispersal systems.

22. Pawnee D 235. World's most popular ag plane, designed for economical treatment of small to medium acreage. Exceptional maintenance ease. 235 hp, with liquid and dry dispersal systems.





When the emergency is urgent enough to be answered.

Rely on the swift Bell Long Ranger to handle the situation. With its dependability. Capable of landing two stretchers... with medical attendants, direct hospital care with no slow-down to remain on busy highway traffic. The 7-place Long Ranger II gets the job done. Efficiently. Right now.

The following Long Ranger II is a member of Bell's dependable health rescue team. There's the Bell Long Ranger II, its power and improved performance for various emergency missions... and its 10-place, twin turbine 222 with more than enough space and cabin for medical teams in, and carrying the patient out. For brochures on the Bell team, or the full details of your nearest Bell Long Ranger operation, write: Vice President, Sales Marketing Dept. 425, P. O. Box 40, North, Texas 75111, U.S.A.

And remember, whatever your emergency needs are, wherever in the world.

Bell's Health/Rescue is ready.



Payne Airfield in Monrovia, with Air Liberia's new HS748 in the foreground

AIRPORT & AIRLINE DEVELOPMENTS in West Africa

A survey by Rex Owusu

THE HISTORICAL development of air travel dates back to the period following the end of the First World War. For instance, the first aeroplane landed in the Ivory Coast in 1923, but regular services did not start until 1937. The French opened the Paris-Casablanca-Dakar air route in June 1925. But everywhere in West Africa, the pace of airport construction picked up steam soon after the Second World War. The victorious Allied powers, realizing the strategic role that the aeroplane played during the war, were quick to implement quickly drawn plans for the establishment of civil aerodromes in all of their colonial territories.

Since the attainment of national independence, most African Governments have continued to expand and improve airport facilities. National and regional airlines were started soon afterwards to provide regular passenger and mail services to the growing capital cities such as Lagos, Accra, Abidjan, Dakar, Cotonou, Freetown and several others. One of the interesting aspects of the development of air transportation in most of West Africa, and indeed, in Africa as a whole, is the extent to which Governments have taken interest in civil airport and airline operations.

Everywhere in West Africa today, Governments have become painfully aware of the vital importance of expanding and improving transportation and communications. Relatively large sums are being committed to the building of new passenger and freight terminals to handle the growth in traffic.

Passenger traffic growth spurs new investments

The rapid growth in business and tourist traffic has meant a pressing need to build new terminals to cope with such growth. In Nigeria, where the growth of domestic and international traffic has seen an unparalleled boom, the Government has spent massive sums in recent years to build modern new terminals in Lagos, Enugu, Ilorin, Jos, Calabar, Port Harcourt, Ibadan, Kaduna and several other cities. It must be emphasized that airport developments in Nigeria have been stimulated by the tremendous economic boom from oil as well as the retarded developments in surface transportation in the country.

In the rest of Africa airport developments seem to follow a general pattern. The main emphasis has been on building new terminal and navigational facilities at the international airports, to the detriment of

domestic facilities. Because of the paucity of other means of transportation and also the need for bridging huge distances in Africa, air travel has assumed great importance as a means of long distance movement of passengers, especially across national borders. As a means of getting about within the national borders, air transportation, although growing in importance, is one of several alternatives in many countries of West Africa.

International airports as gateways for business and international affairs

Whatever other roles international airports play in the life of modern states, none is more important than their role as the national gateways to international commerce and government business. In West Africa, as elsewhere, much use is made by

Continued



One of the Ivory Coast's more provincial airports — Korhogo



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Payne Airfield in Monrovia, with Air Liberia's new HS748 in the foreground

AIRPORT & AIRLINE DEVELOPMENTS in West Africa

A survey by Rex Owusu

THE HISTORICAL development of air travel dates back to the period following the end of the First World War. For instance, the first aeroplane landed in the Ivory Coast in 1923, but regular services did not start until 1937. The French opened the Paris-Casablanca-Dakar air route in June 1925. But everywhere in West Africa, the pace of airport construction picked up steam soon after the Second World War. The victorious Allied powers, realizing the strategic role that the aeroplane played during the war, were quick to implement quickly drawn plans for the establishment of civil aerodromes in all of their colonial territories.

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Continued



One of the Ivory Coast's more provincial airports — Korhogo

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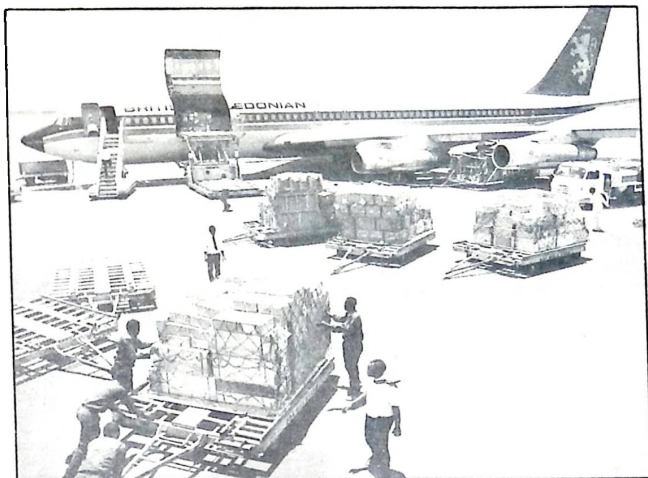
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Continued
ernment officials travelling to all
ers of the earth for official duties, as
as commercial and industrial
cutives, both foreign and local, travel
on business for their companies. In
dition, there is a growing number of
rists, travelling to and from countries in
st Africa in search of sunshine, unsel-
ed beaches and the exotic aspects of
rican culture. But in the sense that West
frican international airports have
sumed the role of national gateways to
e foreign visitor to these countries, they
ve acquired also a certain importance as
mbols of the modernity and national
ide which most newly independent
ations feel as part of their cultural
mbols of success and status. To this end,
ese international airports have become, in
hemselves, quasi-tourist installations.
Most Governments are anxious to
mpress visitors to their countries. As most
visitors to West Africa tend to confine their
ay to the capital cities, the first and
most lasting impression of the country is
ained at the international airports. It is for
his reason that many governments in West
Africa, and indeed in many parts of Africa,
have begun to give increased attention and
investments to improving the terminal
facilities for passengers at their inter-
national airports.

In recent years, new terminal buildings
have been built or are under construction at
Lagos, Cotonou, Lome, Accra, Abidjan,
Monrovia (Robertsfield), Banjul and
Dakar. But although much money and
effort has gone into designing and building
new terminals, it is very sad that not nearly
as much care is taken to maintain these
buildings and associated facilities.

Problems of airport management in West Africa

Modern airports are complex
technological structures whose successful
management on a day-to-day basis calls for
a whole battery of highly trained staff. The
development of air transportation, irrespec-
tive of where in the world it occurs, is a
capital-intensive, high technology industry,
requiring the assembling and co-ordination
of complex skills. In many countries in
West Africa, the post-independent rapid
expansion of airports and national airlines
has been bedevilled by shortages of
experienced indigenous engineers, pilots,
air traffic controllers, maintenance
technicians, and a whole range of other
skills needed to operate modern airports
and airlines safely and efficiently. As a
result of these shortages, it is often almost
impossible to maintain equipment such as
radars, instruments landing systems,
distance measuring equipment (DME),
VHF Omni-range radios (VOR), VHF
aeronautical fixed telecommunications
networks (AFTN) and airfield lighting
systems to the very high standards recom-
mended by the International Civil Aviation
Authorities. In addition to the problem of



Speedy and efficient handling on the apron is one of the essentials

trained staff, many Civil Aviation
Administrations often have to battle with
their Government Treasuries for scarce
foreign exchange with which to purchase
spare parts for unserviceable air
navigational equipment.

West African airlines face up to air traffic growth

In the last ten years or so, air traffic in
the West Africa sub-region has grown quite
dramatically. The national and regional air-
lines such as Air Afrique, Nigeria Airways,
Ghana Airways, Air Mali, Air Guinea, Air
Mauritania and others have been carrying
increasing numbers of passengers along
their regional routes in West Africa. The
air corridor along the coastal belt,
stretching from Nouakchott in Mauritania to
Douala in the Cameroon is one of the
busiest in Africa. Apart from the above air-
lines, other foreign carriers such as UTA,
British Caledonian, Lufthansa, Swissair,
Pan American, Alitalia, Sabena, Iberia,
KLM and Aeroflot all fly into the area. In
spite of this, it is not unusual to find
stranded passengers who have been left
behind in departure lounges as a result of
overbooked flights. On three occasions
during the last two years, the writer has
suffered this rather undignifying experience
at airports in Accra, Abidjan and Lagos.
No doubt many, many others may have
suffered a similar fate.

One of the causes of the problem of
overbooking seems to be a shortage of air-
craft, often leading to cancellation of
scheduled flights. Many of the national air-
lines of the region, with the exception of
Nigeria Airways and Air Afrique, have
only a handful of aircraft with which to
meet their schedules. This naturally robs
flight operations managers of any flexibility
during emergencies. But new aircraft are

expensive, and except for oil-rich Nigeria,
not many countries in West Africa can
afford the going prices of the fashionable
new jet aircraft.

Nigeria Airways, thanks to the oil
wealth, is not only able to afford brand new
wide bodies and medium-haul aircraft, but
is able to plan comfortably for massive
increases in both domestic and inter-
national passenger traffic. After a
protracted period of management and staff-
ing crises, the airline seems to have
emerged from the doldrums. Nigeria
Airways is now gearing up to accept the
challenges of Nigeria's economic expan-
sion. New routes have been opened to
many parts of the world, following the
signing of bilateral air agreements between
Nigeria and other countries.

But perhaps the most interesting airline
of the region is the multinationally-owned
and operated Air Afrique. Contrary to
expectations, Air Afrique has weathered
the anticipated rivalries and political con-
flicts emanating from its multinational
ownership, and is perhaps one of the best-
managed airlines in Africa. However, it is
also the one airline with the poorest record
of Africanisation, especially of its flight
crews. Since its formation, two member
states, Cameroon and Gabon have pulled
out to establish their own national airlines.
In spite of their action, there continues to
be a very high degree of airline and civil
aviation co-operation among the remaining
franco-phone West African States. Civil
airport management is efficiently carried
out by the Agence pour la Sécurité de la
Navigation Aérienne en Afrique et à
Madagascar, ASECNA. This body has
done a great deal to achieve uniformity in
standards and practices in airport manage-
ment and air traffic control facilities in the
sub-region, having established multi-
national civil aviation and pilot training
centres in Dakar, Senegal and Niamey,
Niger.

Africa wrote the rules



It can be hot, it can be scorching or it can be bitterly cold. Your destination can be conveniently at sea level or unoblingly five or six thousand feet up. Distances can be vast.

Africa wrote the rules of business travel and left us to figure out the best way to play the game.

New turbofan engines give the 125/700 a range of 2660 statute miles non stop, and some 30% saving on fuel consumption against comparable turbojets. Lagos-Madrid; Luanda-Maputo; Nairobi-Johannesburg - now one-hop flights for travellers in a hurry.

Long range flights make passenger comfort essential. With 8 aboard, each passenger has 80% more cubic space than in a Jumbo. Space beyond mere seating for all the necessary amenities.

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Thoughtfully, there's 5ft. 9in. aisle headroom. Naturally, there's a galley for hot and cold meals. And Polaroid windows that eliminate glare.



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It's where the airlines can't go that the series 700 best demonstrates its flair for getting the job done. Rough strips, no ground support facilities and locations up to 10,000ft. above sea level.

The 700 has self-contained APU, airstairs, and a rugged undercarriage with steerable nose wheel. Gets you safely in—and out.



Aircraft manufacturers generally avoid talking about safety and flying. We see reason to duck it.

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In Country Demonstrations will be conducted as follows:

Banjul - July 11

Freetown - July 13 and 14

Monrovia - July 17 and 18

Accra - July 20 and 21

Lagos - July 28

Nairobi - July 31, Aug 1, 2 and 3

Please contact our London Office for further details.

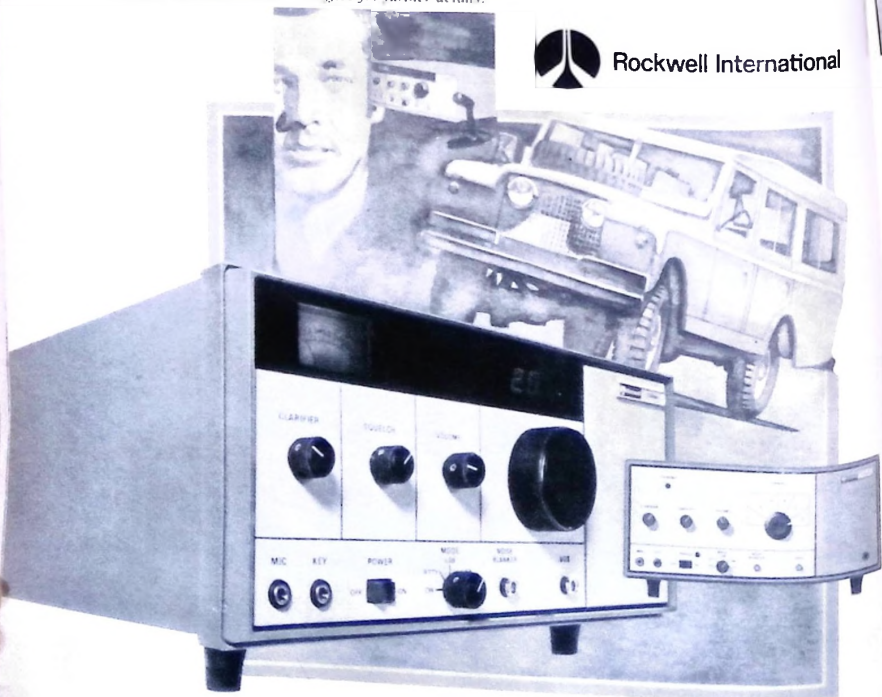
Both are field programmable and available either fixed or mobile configurations. Vehicular design allows for dashboard controls while trunk-mounted transceiver helps guard against theft.

The HF-280 Series is ideal for long range communications beyond line of sight. It is compatible with CCIR/ITU requirements.

Details? Contact The Rockwell-Collins sales office in London. Tel. 01-753 9911. Tlx. 25468. HF Marketing, Collins Test Communications Products Division, Rockwell International, Cedar Rapids, Iowa 52406, U.S.A. Phone 319/395-4500.



Rockwell International



THE COMPANY AIRCRAFT

An Essential Tool of Modern Commerce



Alan Bramson looks at the various executive aircraft on the market and the reasons for companies to buy their own aircraft — not nearly such an extravagance as people think

BEST TO the average company try that the board of directors might a computer and he will almost tly rub his hands in glee. Put to him opposition that the company should its own aircraft (for probably less cost many an average computer) and he rry likely blow a fuse. Supporters of ss aviation would point to the le of the United States of America the corporate aircraft was long shed only to be told "yes, but look at listances". Yet the truth of the matter in the USA, where there are some 30 light aircraft (i.e. those below 3000 lbs in weight) and around 750,000 pilots, most business trips are flown instances of 500 miles or less.

ope has probably the best developed ail system in the world and over distances of, say, 200 miles or so the train cannot be challenged by the fastest aircraft. But the aeroplane, the slowest of the breed, comes into its when journeys involve changing from a car to boat or on occasions when a ss trip includes visiting a number of

places on route. It would be fair to say that, in those countries without a major road network the aeroplane can make the impossible a reality and it has been proved cheaper to build airfields at community centres than to embark on a new railway system.

Readers of this article should consider such road or rail journeys as Dakar to Bathurst, Nouakchoot to Tambacounda or Monrovia to Abidjan, estimate how long these would take by car or train then compare the times with those for the same trips by air. Such comparisons can be nothing short of staggering, particularly

A Brittan-Norman "Long Nose" Islander, 10 seat multi-purpose transport aircraft.



when there exists no direct road or rail link between the points of departure and arrival.

In aviation distances are measured in nautical miles and speeds are quoted in knots (i.e. nautical miles per hour) but I shall give kilometer equivalents in most cases. Thus Monrovia to Abidjan, a distance of 290 nm (540 Km) by air, would take 2 hrs 15 minutes in an average light single-engine aircraft, 1 hr 30 minutes in a light twin, 1 hr 10 minutes in a turboprop while a modern business jet would devour the trip in about 45 minutes. Unlike road or even rail distances, if indeed they exist, the air distance from one place to another is, in most cases, a straight line and this in itself represents a considerable saving in time.

In my experience businessmen with no first hand knowledge of aviation are prone to asking the most elementary questions since, to them, the aeroplane and those involved with it represent another world. Therefore the remainder of this article is based upon many of the questions so often asked of me. These I shall try to answer in everyday terms.

Continued

Are light aircraft able to fly in bad weather?

In some respects the biggest improvements in aviation have been in radio aids. The advent of the transistor and micro-miniaturisation techniques has seen the emergence of light weight avionics (aircraft radio) that take up little room so it is not uncommon to find even single-engine light aircraft equipped to standards that, even in large airliners, would have been undreamed of 25 years ago.

For an aircraft to fly in bad weather it must be equipped with radio navigational and landing aids, for preference it should have two engines (this I shall explain later) and it must be fitted with adequate de-icing equipment. Without it there will be days, even in Africa, where risk of airframe icing may keep you on the ground unless it is possible to route around the icing conditions. Therefore the answer to the question is that all-weather operation is dependent upon the type of aircraft and the scale of equipment fitted. A well equipped single, and particularly a good light twin, can fly in quite poor weather, a turboprop can do even better while the small business jets will provide over-the-weather travel to the same standards as the big passenger jets although naturally their non-stop range is less.

Why have more than one engine

Although modern engines have reached very high standards of reliability engine failure cannot be completely eliminated because of factors often outside the control of the designer or manufacturer. For example, fuel may be contaminated or poor maintenance could be the cause of engine failure. An aircraft without power becomes a glider so that engine failure in a single-engine aircraft demands that it must glide down to land. When the terrain below is flat and of reasonable surface no damage need result in the ensuring forced landing. But suppose the aircraft is above cloud at the time of power failure and the pilot has to glide through only to descend into the mountains or over the sea. Clearly when a company is unlikely to make other than short journeys over moderately hospitable countryside a good single-engine aircraft



The Avions Robin MR/100/250 an outstanding single-engine light aircraft capable of flying four people at a speed of 296 km/hr over distances of 1390 km. Alternatively when three people are carried the fuel tanks may be filled when the range is a useful 2220 km.



The pressurized Beech Baron 58P is one of the smallest of the light twin-engine offering a pressure cabin for up to six people including the pilot. With six occupants it can fly at 20,000 ft for over 800 nm at a speed of 215 knots (400 km/hr).

may be adequate. But when repeated long trips over mountains, water or forest are involved a twin-engine aircraft is essential. However the reliability of modern light aircraft should not be underestimated. A few years ago I flew a light single manufactured by the Robin company of Dijon, France, from London to Dakar and back, on what amounted to a return journey of some 6,000 nm (11,300 km) over a relatively short period. Other than adding a little oil to the engine at Dakar and putting in some more back in London no maintenance was necessary.

Can light aircraft fly over the weather?

In Europe and North America usually very little cloud above 30,000 feet, but in West Africa matter any region near the earth's atmosphere extends to heights and large thunder clouds develop up to 40,000 feet or maximum practical height (known as Service Ceiling) of the simpler type around 18,000 to 20,000 feet. Some of the manufacturers (



Piper's pressurized Navajo

supercharged versions of the this category capable of climbing to 7,000-10,000 ft it should be able to fly above 10,000 ft cruising level and crew are required to wear oxygen masks. Whether or not one can fly at this fact remains to be seen. It makes it impossible for business aircraft to be discussed in comfort while in flight.

Those companies requiring a number of key personnel could fly a twin-engine aircraft of 500 nm or more may be worth considering purchasing one of the light twins, particularly when it is required that much of the flying is likely to be over several hours at 20,000 feet or more. An aircraft will provide a



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The airlifter that's better than new



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And while Hercules keeps getting better and better, it's also looking better and better as fuel costs reach for the sky. Herc's turboprop engines use far less fuel than fanjet engines. 50% less in some cases.

Hercules was born with a classic airlift shape, so simple and functional that it has become almost timeless. And within that simple shape, Lockheed has

improved Hercules from nose to tail. All have been improved. New ones have been first flew. An airlifter that's far better than

The result: an airlifter that will be serving a century. An airlifter that's also been chosen. An airlifter so versatile that it also serves as a patrol plane, tanker and in many other roles.

The Twin Hercules. Lockheed is proposing the L-400, a twin-engine version of Hercules, to carry loads such as 22,500 pounds for 550 miles—or 15,000 pounds for 1,400 nautical miles. It keeps getting better and better.

Lockheed 11 1

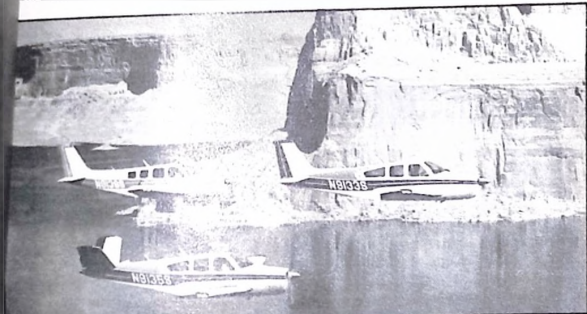
...ual
 ...ent height of 8,000 feet or less and
 ...ow business discussion to continue in
 ...ort throughout the flight.

as the Turboprop er any advantages?

...the end of this article is a table
 ...ing the relative performances of each
 ...s of aircraft but the light twins
 ...tioned so far offer seating for 5-9
 ...engers, cruising speeds of 175-250
 ...ts (325-465 km/hr) over ranges of
 ...een 800-1,200 nm (1,480-2,320 km).
 ...boprops represent the next step up the
 ...iness aircraft ladder. They are faster,
 ...higher, offer greater range and are
 ...erally quieter.
 ...The smaller turboprops provide 6-9



Up to eight passengers and two crew may be carried in the Rockwell Turbo Commander 690B which is powered by two Garrett Aireserch engines of 715 hp each



Beechcraft Bonanza A36, Bonanza V35B, Bonanza F33A

...passenger seats while larger aircraft such
 ...as the Beech Super King Air 200 will take
 ...up to 13 occupants as well as two crew.
 ...Obviously the turboprop is a more expen-

...sive vehicle to buy than even a pressurised
 ...piston-engine twin but to some extent this is
 ...offset by the longer life of gas turbines and
 ...the cheaper fuel used.

...Spacious interior of the Hawker Siddeley HS125/700 business jet. This example is fitted as
 ...a standard business aircraft with seating for eight. Up to 14 seats can be specified. The door
 ...leads to a washroom.



Is a jet aircraft better than a turboprop?

It all depends on your company require-
 ments. If business trips are limited to
 journeys between Accra and, say, Kumasi
 or the example already mentioned
 (Monrovia/Abidjan) then a single-engine
 aircraft will do nicely when two or three
 passengers are to be carried. Monrovia/Abidjan is a good example to
 use because there are no direct road or rail
 links yet the air distance is only 290 nm.
 Obviously a light twin will be faster, more
 comfortable and capable of flying more
 passengers in worse weather while some
 would consider a turboprop to be wasted
 on such short journeys. As already
 explained, the turboprop presents real
 advantages over even the best piston twins
 on, for example, a flight such as Dakar to
 Libreville, Gabon. Using the airways
 system (official air corridors which are
 served by conveniently located radio
 beacons) this journey of 1,800 nm (3,350
 km), one third of it over the sea, would
 require an intermediate landing by most of
 the turboprops. Allowing time for landing,
 refuelling, taxiing out and taking off this
 journey in a Rockwell Turbo Commander
 690B (one of the faster turboprops) would
 take about 7-7½ hours.

Refuelling stop usually necessary

Most of the small business jets would
 likewise need to make a refuelling stop and,
 taking the Cessna Citation I as an example
 (it being the cheapest and lowest powered
 jet on the market) the same journey would
 take approximately 6 hours; a worthwhile
 if not startling saving in time but a much
 quieter journey than even the best tur-
 boprop could provide with the added
 advantage of cruising some 10,000 feet
 higher. Some of the more powerful Learjets
 such as the 35A or the 36A could handle
 an 1,800 nm flight non-stop but these air-
 craft have a similar cabin size to the little
 Cessna Citation and many are of the
 opinion that while such an aircraft is ade-
 quate for 3-4 hour journeys longer flights
 demand a greater degree of comfort.

Continued

CERAMICHE
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Metropolitan Distributors Ltd
18, Rue

General Details of Light and Business Aircraft Capabilities

Aircraft Category	Equipped Price Range (US\$)	Cruising Speeds, Knots (Km/hr)	Range with Fuel Reserves, nm (Km)	Time to fly DAKAR to BOBO DIOLASSO, fastest and slowest aircraft in Category
Single-Engine (4 seats)	22,360— 56,000	125-160 (232-298)	600-900 (1110-1660)	5 hrs 15 min 7 hrs 30 min (1 stop)
Twin-Engine Unpressurised	70,000— 193,000	175-250 (325-465)	800-1200 (1480-2220)	3 hrs 20 min 5 hrs 40 min (1 stop)
Twin-Engine Pressurised	133,000— 316,000	205-252 (380-468)	980-1200 (1810-2220)	3 hrs 20 min 4 hrs
Turboprop	520,000— 1,065,000	222-310 (410-575)	890-2000 (1640-3700)	2 hrs 45 min 3 hrs 50 min
Jet (up to HS125 size)	1,050,000— 3,375,000	352-477 (650-885)	1100-3180 (2040-5900)	1 hr 55 min 2 hrs 25 min

continued

Other than the four-engine Gulfstream II, the very large Cessna Citation and the very large Cessna Gulfstream II, a company jet of the size of a BAC111 or a DC9 (the biggest of the small jets (if one may use such contradicting terms) is the Piper Arrow II 125/700, a relatively low-powered miniature jetliner offering 8-14 passenger seats according to internal layout, a six foot wide cabin with headroom allowing people of average height to stand, a full size toilet room with hot and cold running water and a standard of passenger comfort that equals the best on offer by the major airlines. Cabin noise level is better than that of a large passenger jet and operating costs per seat mile are probably among the lowest of any business jet. The HS125/700 would fly non-stop from Dakar to Libreville in about 4½ hours.

The Cessna Citation which at 12,500 lbs maximum weight comes within the light aircraft category, can be operated out of relatively small airstrips but some of the other bizjets use a little more take off and

landing distance when operated at high weights.

In essence there is no simple answer to this question. It all depends on the type of business operation. Sufficient to say that more than 400 HS125 aircraft of all models have been sold and since the 700 series was placed on the market late last year approaching 50 have been sold and orders are coming in at a rate of one a week. Here are some more journey times relating to this outstanding aircraft:—

Kano-Tripoli	3 hrs 30 min
Dakar-Casablanca	3 hrs 25 min
Accra-Kano	1 hr 45 min
Algiers-Las Palmas	2 hrs 45 min

Why not use the airlines?

Companies making infrequent visits to cities within the airline network would probably find it hard to justify a business aircraft. But when your business involves regularly sending executives to places without a major airport, visiting customers at short notice or getting urgently needed

equipment to destinations not served by rail, road or scheduled airlines a business aircraft can prove a vital asset. The saving in executive time, hotel bills, days away from having to conform with an airline timetable and the priceless value of being able to 'get-up-and-go' at short notice have for many years justified the astonishing growth of business aviation in the USA, Canada, Australia and even Europe with its highly developed road/rail systems. To West Africa, with its vast distances, few rail links and undeveloped road system, the aeroplane can offer new business opportunities.

Hourly and fixed costs

Running costs are usually regarded under two headings:—

Fixed Costs — Insurance, Depreciation, Hangarage, provision of airworthiness renewal, Crew salaries.

Hourly Costs — Fuel, Maintenance, Landing Fees, provision for engine overhaul.

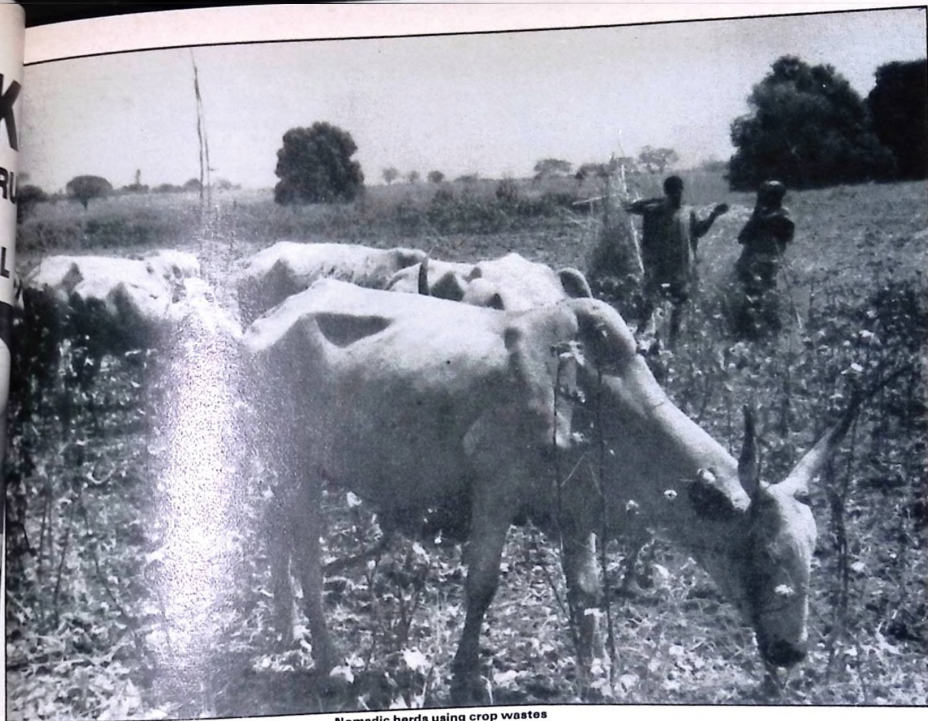
Obviously the Fixed Costs remain static irrespective of the amount of flying per year so it therefore follows that an aircraft doing 750 hrs pa will cost less per hour to run than if it were only flying 400 hours in the same period. To obtain an economic utilisation, generally regarded as being at least 600 hours pa, some companies share an aircraft and its crew. It is also not unknown for business owners to charter their aircraft when it is not on company duties; yet another way of reducing operating costs.

Tax concessions vary from state to state but, in the main, owning a company aircraft can be financially attractive provided the company has a need for its own air transport.

One has only to study the map, estimate some of the journey times by road or rail from place to place and compare them with what even the simplest light 'plane can offer to realise that West Africa is made for aviation. □

Air Liberia's new HS748 with a capacity of 44 passenger seats





Nomadic herds using crop wastes

INCREASED LIVESTOCK PRODUCTION FROM EXISTING RANGELAND IN WEST AFRICA

In this third article on agricultural development in West Africa, T. R. W. Jarman of Minster Agriculture looks at the problems that have occurred concerning livestock production and suggests ways to control them to increase production

AS THE populations of the countries of West Africa increase and prosper, the demand for meat and livestock products from the traditional sector within the country also increases. The main effect of this is that the demands made upon the national herd of the country cannot be wholly met by this traditional sector. As a consequence elaborate and often expensive schemes are considered as alternative ways of increasing the supply of animal products on the market. These schemes include the importation of meat, the importation of exotic cattle to increase the output of the national herd and the growth of the intensive poultry industry, much of this development based on imported feeds. Effectively the countries concerned are buying in "acres" from another country to feed its people, when there are often large areas to

spare within the country which are underutilised.

The drift from the land

Several factors have led to this underutilisation of a country's total land area, some of these include:-

- 1 The dissatisfaction with the financial returns received for physical inputs in agriculture compared with the attractive financial incentives of working in urban industrialised areas. Thus the drift from the land leads to low rural population densities and shortage of agricultural manpower.
- 2 The systems of land ownerships and rights to farm. This usually affects the livestock keeper rather than the vegetable

or crop producer in that there is less "responsibility" placed on him leading to the consequential mining" of the resources of the soil and vegetation.

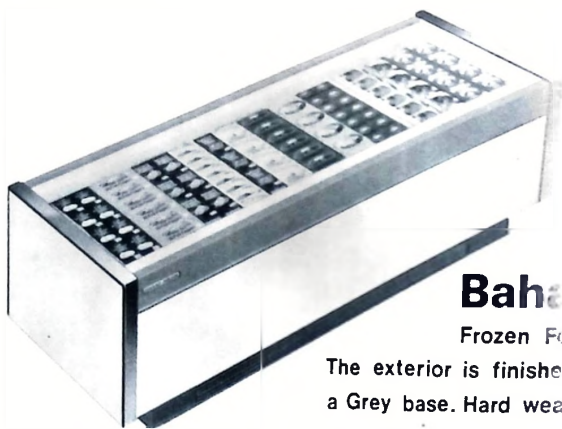
- 3 The population pressure around villages and cities creating areas of over-use, in some areas but underutilised in others. This situation is often created by the demand by the population on state services such as health and education and also for general trading.

- 4 Communications are often underdeveloped and cause the rural populations to be more isolated and unable to use the state services. In these situations one finds ribbon development along major road networks with very little development in the interior.

- 5 Education and extension services which

Continued

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intended to encourage intensive culture and the greater use of methods which are not entirely applicable to the situation in which they are to be used.

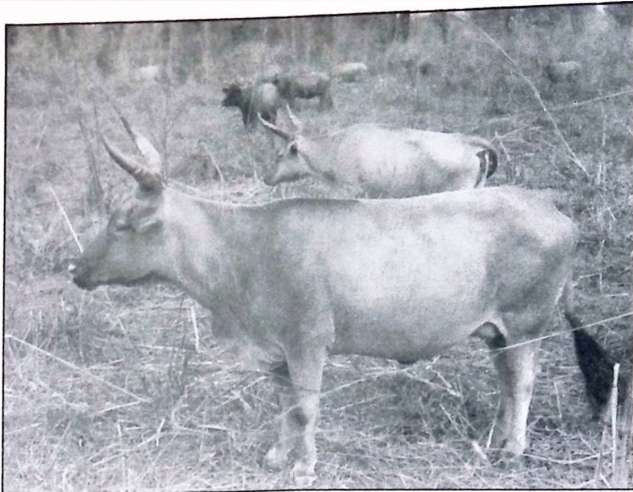
Climate, environment and the presence of disease which has tended to dictate the pattern of livestock husbandry throughout West Africa. The Tsetse fly has prevented the keeping of cattle in many areas.

The rainfall patterns which have dictated where the grazing or available vegetation as a food reserve exists. This has meant that the migratory habits of many of the West African stockkeepers has been the only way of utilising the scarce resource.

It is, therefore, important in these days of import saving and substitution to consider ways of using these underutilised areas more effectively. Firstly we should consider where these areas are.

Tsetse — the unseen enemy

Unfortunately, the war against the Tsetse Fly, the carrier of Trypanosomiasis or sleeping sickness, has not been won in West Africa and, as a consequence, those areas which can be used for cattle, sheep, goats, camels and donkeys are limited. For this reason, few cattle are kept in the tropical forest regions of West Africa, except in small concentrations of perhaps exotic breeds kept for milk production near urban centres. The natural grasslands do not exist in this tropical forest region, therefore, not considered cost effective that these areas be clear for the production of grass but should be used for direct cash sale crops. Livestock keeping in these areas is only economic if based upon the use of crop by-products. The environmental aspects of forest clearance substituted by open grassland



The Ndoma — A breed which has a higher tolerance to Trypanosomiasis — the disease spread by the Tsetse fly

is also questionable where high rainfall leads to erosion and a constant battle exists to prevent bush or forest encroachment.

Natural savannah grasslands idea

The natural savannah grasslands of West Africa are, therefore, the obvious areas for livestock keeping. Once again, however, the Tsetse fly limits the intensity with which the area can be used. The fly extends through the whole region within 14° north of the Equator. Grassy highlands

over 4,000 feet in altitude which are too cold, eg. the Cameroon Highlands or the Jos Plateau, and open country where the dry season is not too hot and desiccating for the fly to breed successfully, eg. Northern Nigeria and Niger, are the only areas within this zone where the Tsetse fly is controlled by nature.



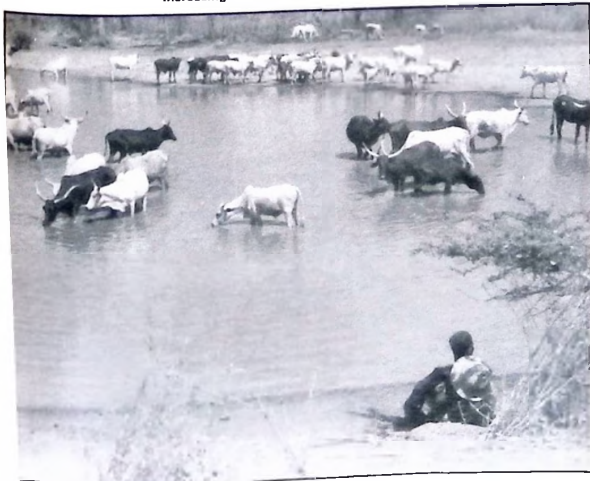
WEST AFRICAN FARMING

Considerable effort and expense is being expended on the control of Tsetse throughout the region. Nigeria has initiated several different programmes for controlling the fly and these include aerial spraying, bush clearance, tolerant breeds of cattle, attentivated or sterile male fly releases. Gradually the areas are shrinking but it is difficult to envisage West Africa totally free of the Tsetse fly. Huge strides have and are being made in the eradication of some of the other debilitating diseases affecting the region such as Foot and Mouth, Rinderpest, Bovine pleuro pneumonia, Haemorrhage Septicimia, Black Quarter and Anthrax. Joint eradication programmes, where neighbouring countries co-operate to vaccinate against a certain disease, such as the JP.28 campaign against pleuro pneumonia has done much to make the area more habitable to livestock.

The livestock area, therefore, is composed of large natural grassland savannah which provided it is conservatively managed can sustain livestock production. The management of the grazing areas in the past and even today has been carried out somewhat unconsciously by the nomad who has followed the growth patterns of the grass according to the seasons. Migratory habits tend to be southwards during the dry season in search of fodder

Continued

The provision of water at a reasonable distance from the grazing area is of prime importance in increasing livestock production



Continued

which might recently have received rain. The drier season also lessens the risk of attack by the Tsetse fly. As the rains approach and the grasses begin to recover in the drier semi arid areas of the region, so the herds tend to migrate northwards. This naturally evolved grassland or rangeland management. This is that grass must be rested and allowed to recover and it is only a renewable resource if it is not severely damaged by grazing and trampling.



WEST AFRICAN FARMING

Increased livestock production from rangelands, therefore, is fundamentally a question of rationing the available grass or fodder and allowing a sufficient time for regeneration before further grazing or harvesting is allowed. The principle method by which this resource of fodder can be rationed is by controlling herd size or numbers of animals in the area.

However, before this can be achieved one must determine how many animals are already using this resource and how productive the rangeland is, in other words, how many animals is the range able to support over a sustained period of time. The word sustained is important since it is difficult to imagine nomadism continuing for another century or even fifty years with the demands on the land which the increasing populations are already making. That is not to say that livestock keeping should be discouraged, on the contrary, if anything,

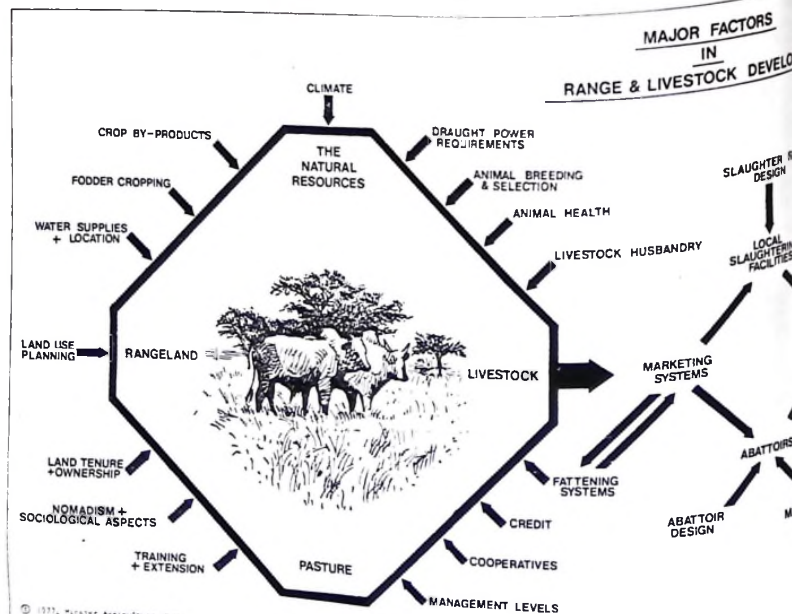


The importance of considering vegetation for browsing as well as grazing in the management of rangeland feeding capacity.

the demand for their ability to use areas which are not suitable for intensive crop production or their ability to return nutrients to the soil competitively with the increasing cost of chemical fertiliser make them more attractive. What is required is control of the rate or severity with which the natural resource is harvested to a level which is in balance with its regeneration or resupply.

Agriculture — the future landbank

Making the livestock owner for the area on which he has banked cause him to "bank for the future" rather than "mine the present". Agricultural livestock ownership is a continuous activity and if it is to continue to



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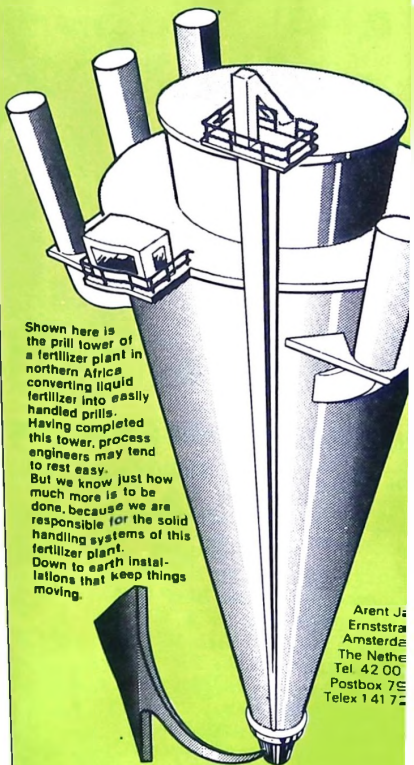
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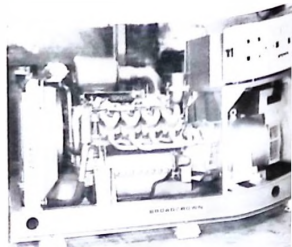
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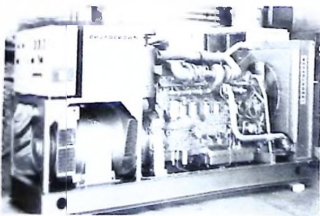
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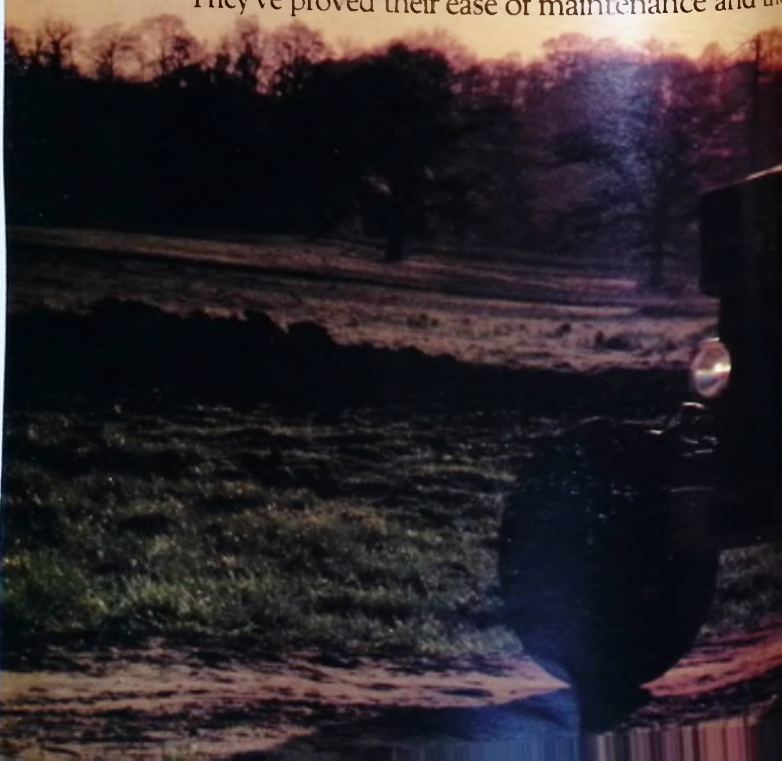
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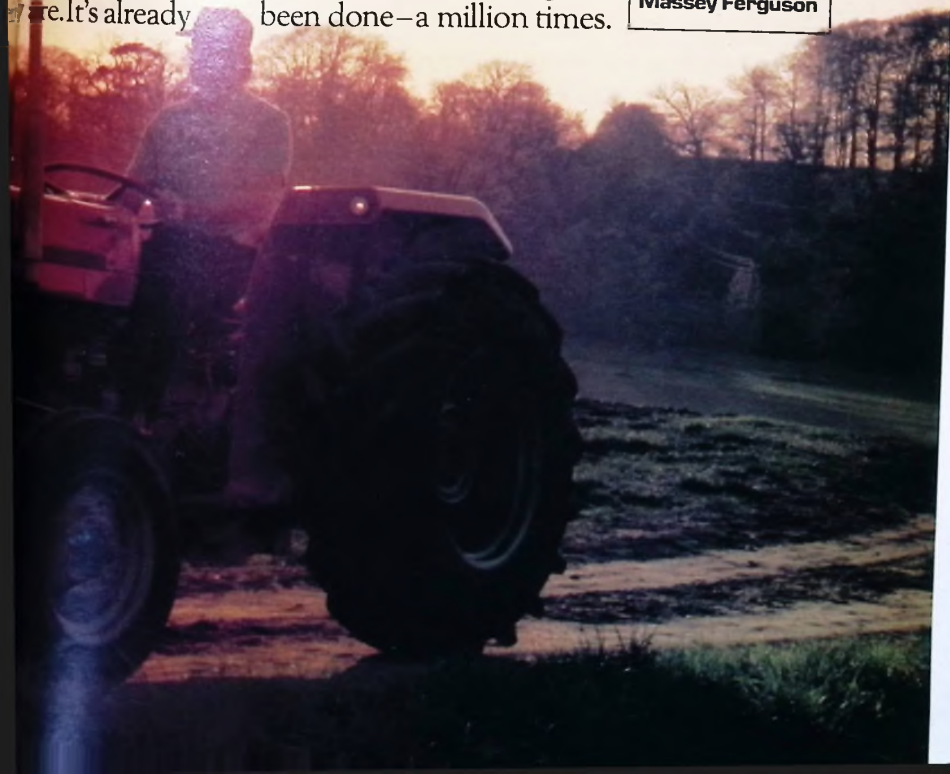


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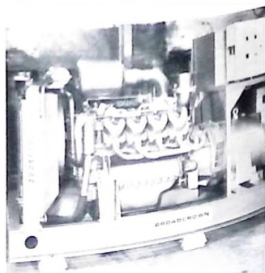
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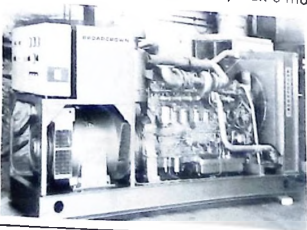
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Economic pressure will increasingly force the livestock owner to attempt to obtain greater yields from both his rangelands and from his food/fodder production areas. Invariably this has been encouraged by governments and research organizations with the use of imported genetic material. For example, the introduction of European breeds for breeding purposes. The cost effectiveness of the introduction of exotic species, both of animals and plants is questionable. This is especially true where the maximum potential of the local species has not yet been reached. It is well-known that management has far greater potential than breeding. Finance should be directed more towards improving the methods of management and the development of infrastructure if livestock production from Rangelands is to be improved.

Management — a question of control

Recent research in Africa has clearly shown that it is technically possible to more than double the productivity of indigenous



Is there a place for nomadism in today's technological world?

cattle by introducing certain particular, through quite simple, management changes in livestock husbandry techniques. Briefly, the requirements are:-

- the provision of adequate water supplies within reasonable distance of the grazing area.
- the provision of mineral supplements and attention to disease control.
- a degree of fencing or stock separation so that breeding herds can be controlled, by the separation of young stock at weaning and the retention of some fodder reserves for dry season feeding.
- infrastructure which will allow easy access to marketing facilities so that the offtake from the national herd encourages the keeping of economic

sized herds rather than the storage of wealth in livestock.



WEST AFRICAN FARMING

These measures are particularly concerned with indigenous stock on extensive farming systems. There is little doubt that if these measures could be adopted a great improvement in the output from the national herds of West African countries could be achieved. This would not only utilise savannah areas more effectively than is done at present, but would also enable greater self-sufficiency in meat production.

Summary

In summary, therefore, increased livestock production from Rangelands in West Africa is dependant upon:

- Assessing and understanding the capability of the natural resources available. The resources of land area, natural grazing and browsing capacities and the value of indigenous stock.
- Enabling the livestock owner to have a greater responsibility for the area he uses.
- Creating an economic climate which enables the producer to achieve a long-term income from his stock.
- Providing facilities for improving the keeping of livestock and controlling the offtake of slaughter stock.
- Continuing the eradication of endemic diseases.

The factors which the authors consider are of major importance in Rangeland management are shown in the diagram on the previous page.

It is time to invest in those natural rangelands so that by their responsible utilisation, the output of food will increase rather than the desert advance. □

The adaptability of livestock to today's urbanisation



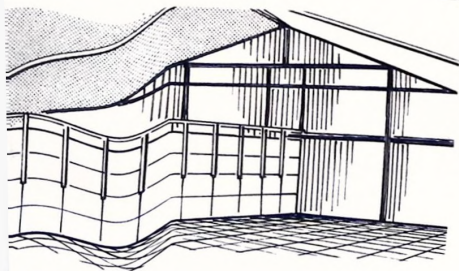


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CATTLE HANDLING SYSTEMS

As livestock farming becomes more sophisticated the need for improved handling methods has grown. This article considers the increasing requirements that must now be taken into consideration when designing a handling system.

IN COMMON with most agricultural practices today, livestock farming is advancing rapidly into new fields with more and better stock being bred, which in turn calls for improved methods of handling, penning and feeding. Today a higher performance is expected from livestock than nature ever intended, thus calling for more intensive care and the need for regular medication for control of parasites and immunisation against various diseases. The development of handling techniques has progressed rapidly in some countries, others being able to benefit from their knowledge and experience.

It is important that operators and animals are not subjected to excessive stress. Most livestock can be handled without difficulty provided their basic instincts are understood by those carrying out the handling and that these are borne in mind when designing a system.

The first instinct of an animal contained in a pen is to escape; a carefully designed funnel, leading into a narrow passage or race, encourages animals to present themselves in single file, from which position almost any work can be carried out. The composition and components of the race are important so various items have been devised to fit into portable and fixed races, ensuring the smooth flow of animals through the system. Whilst many cattle handling facilities are built on a permanent basis, there is much to commend a robust

portable system. It can be much quicker and easier to transport the cattle handling equipment on a light truck or trailer behind a land rover to the cattle, than to drive the cattle long distances, which is not only time-wasting but has a detrimental effect on the animals.

Design and Layout:

When designing a cattle handling system, a large group of cattle is systematically broken down into smaller groups, until the animals are finally brought into single file in the cattle race. The size of the pens and the length of the race is related to the number of cattle to be handled at one time. When the necessary work has been defined, a decision can be made on such facilities as drafting gates, one-way gates and access gates for the operators.

The angle of the funnel leading into the race should be between 25°/35° — if the angle is wider cattle tend to turn in the mouth of the race instead of going into it — when the angle is correct and the animals in the funnel are approaching the entrance to the race, one animal is normally slightly ahead of the rest and they sort themselves out. The flow of cattle is soon established and everything works smoothly.

The length of the cattle race depends largely on the number of cattle being

handled but it has been found that in an effort to economise some farmers have built the race too short. On a portable system a race of 6/10 metres is recommended; in a fixed situation the race can be almost any length from 10/30 metres, or more. On a very long race it is advisable to

Continued



No escape here!



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curves or gentle angles in the race, as the weight of one animal disappearing round a corner can act like a magnet to other animals following at some distance behind.



Good example of a semi-permanent layout for a number of cattle.

The height of pen and race sides depends on the materials used, also on the angle. A wooden fence presents an obvious solid obstacle to the animals and the more readily jump solid fences than those made of tubular steel, which has a greater proportion of gap to rail. For this reason, the rails is important and the rails usually start with 150/200 millimetres gaps at the bottom to a top gap of as much as 350 millimetres. With this wide gap at the top in a steel hurdle, frisky animals attempt to jump between the second and top rails rather than over the top rail and we have found that 1.5 metre height is usually sufficient for a tubular pen, even with animals not used to being handled. The equivalent wooden fence, however, would need to be

almost 2 metres in height in order to provide the same effectiveness. The wooden system would of necessity be of the fixed nature, whereas the tubular steel system can either be fixed, portable or both.

It is also important to know what specific treatment is to be carried out on the cattle when the handling unit is being designed. Where foot problems exist, suitable stocks and winching facilities are provided in order to immobilise the animal while being treated and keep its feet under close control. These tasks should be carried out quickly, quietly and efficiently. Roping and throwing the animal, for example, is bound to cause a great deal of distress; animals under stress do not perform well.

The safety of animals and operators is very important. Equipment should be designed in such a way and in materials which will not injure animals or operators. For example the sides of the race and the pen fences (provided they are not sheeted) should have gaps sufficiently wide for animals that put their feet through to retrieve them easily. In other words, no traps. For example — it is best to avoid using diagonal bracing for livestock. Diagonal braces have caused a great deal of injury to stock over the years.

It should not be necessary for the operator to get in with the cattle once they are moving in the general direction of the race, but should be able to operate the various parts of the cattle handling system from outside, either by levers or ropes. For

stubborn animals, an electric cattle goad can be a great help, particularly if it is the type with an extended probe.



The Carry-Crush ready for use.

The design of the headgate is important and sufficient space must be allowed for animals' horns. Crossbars on the gate must be low to avoid choking. It is important to be able to release the animal from the gate, but at the same time to retain it in the race, particularly if further treatment is required. On the other hand, when the animal has been released from the race, it should automatically be able to step clear or pass through the gate. Some earlier cattle headgates were very dangerous in that the complete yoke mechanism was contained in the swinging portion and the animal had to be driven back before the gate was opened, otherwise there was a risk of a broken neck. □

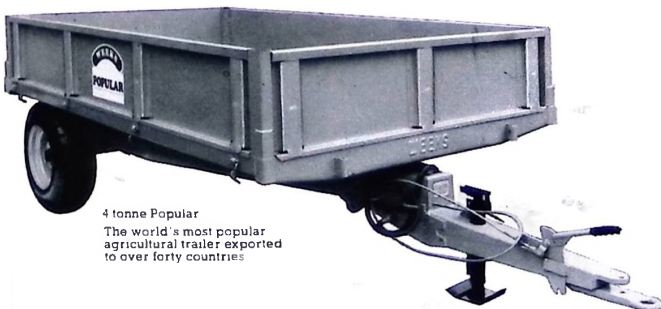
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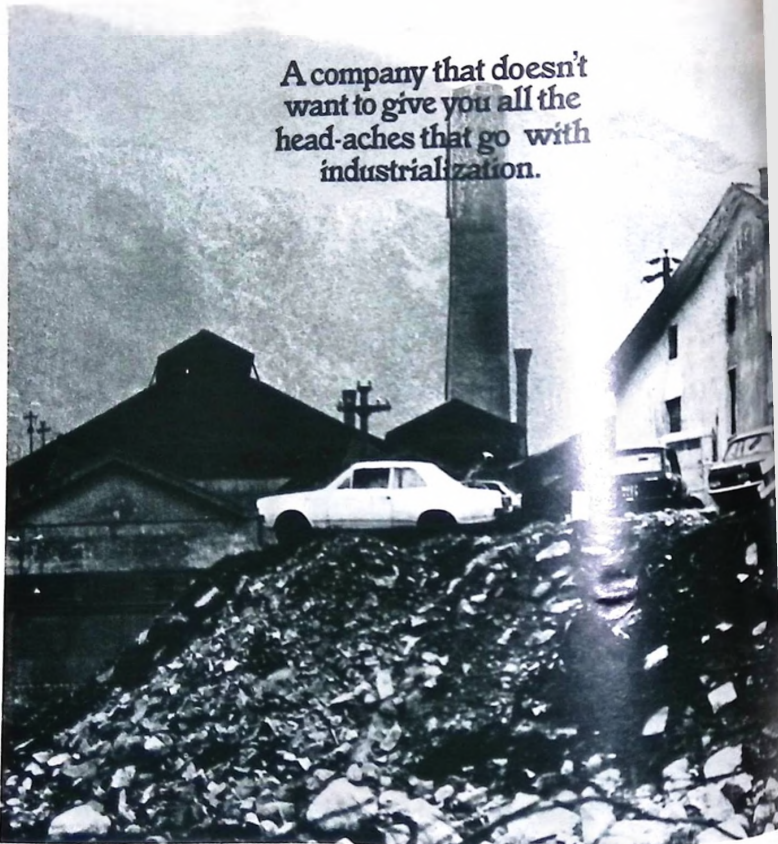
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Constructing together

ROUGH TERRAIN FORK LIFT TRUCKS



International Harvester's 2520C with forks handling lettats.

RTFLs are rocketing in the construction market. A special correspondent looks at the reasons behind this boom and also reports on some of the models on the market.

ALTHOUGH THE first rough terrain fork lift trucks appeared on the market as early as 1961, it was not until the beginning of this decade that these versatile little machines began to be accepted by the European and International construction industry.

Thus, up until about 1971-72 rough terrain fork lift trucks were virtually unknown outside a comparatively limited number of West European contractors. By 1974, however, the market for these machines was booming, and today there are 30 or 40 companies throughout the world engaged in the design and manufacture of RTFLs.

Boom coincided with world inflation

The boom in these machines coincided almost exactly with the oil price explosion which between 1973 and 1974 saw oil prices quadruple, generating the great tide of inflation that swept the world, forcing up

the price of labour and the cost of virtually all raw materials and manufactured products. In a matter of months basic site materials, such as timber, bricks and cement, became very expensive commodities and contractors seriously began to

investigate methods that would reduce the wastage of materials and reduce the total of labour required to move them. The rough terrain fork lift truck achieves both these objectives for a comparatively small capital outlay.

The Hymac Overlander 45 rough terrain fork lift truck. Optional weather proof cab. Fitted with beet bucket.



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continued
 The majority of rough terrain fork lifts based either on a dumper chassis or on standard agricultural tractor unit, to which has been fitted a fork lift mast. These have evolved from those used on standard industrial lift trucks.

Both dumpers and tractors are, by themselves, ideal for moving goods from point to point over rough ground, but they have no capacity for handling the goods to carry. They must, therefore, be loaded and off-loaded by hand or by some other form of plant such as a crane. Alternatively, the goods may be tipped and (as the term implies) simply dumped in a random heap. Wastage of bricks manually loaded and offloaded in this way is seldom less than 7% and is often as high as 10-25%. The wastage on bricks tipped at random is usually in the region of 10% and in the case of facing bricks, where even a minor chip can ruin the display, the figure could be as high as 40%.

When materials were cheap, the level of wastage was, perhaps, tolerable. Today such waste would be totally unacceptable.

Advantages of a rough terrain truck

The standard industrial fork lift truck is perfect for handling goods on a firm, level surface but has no rough ground capability whatsoever. The modern rough terrain fork lift truck, therefore, combines the rough ground performance of tractors and dumpers with the handling precision of a standard industrial machine, an ideal combination for handling expensive construction materials and equipment.

The modern rough terrain fork lift truck, however, is far more sophisticated than either a dumper or a standard agricultural tractor. Most have high powered, multi-cylinder diesel engines mounted within a purpose designed chassis. Often the customer is presented with a choice of engine power and make. The 2½-ton capacity Manitou MB 25C, for example, is equipped with a 45 hp International diesel.



A particular feature of Matbro's M40 centre pivot steer RTFL is its sidelifting mast enabling loads to be lifted vertically, even if the truck is on uneven ground.

Its twin sister model in the range, the MB 25P, is equipped with a Perkins 78 hp engine derated to 64 hp.

Torque converter and hydrostatic transmission systems are standard on many models, and most have quite an advanced hydraulic system to power the movement of the mast — particularly those machines which incorporate side-shift, rear tilt and forward reach movements.

Braking and steering are considerably more robust than anything usually found in standard dumpers and tractors, and many models are now available with four wheel drive, enabling them to negotiate really soft and rutted ground.

The height of lift has been greatly increased and many machines are available with extension mast giving a lifting height of about 6 m., and some are available with a super-extension mast, with a lift height of 7.58 m.

The carrying capacities, too, are increasing. Three or four years ago a 3-ton

capacity machine was considered fairly large. Today capacities range up to 8 tons.

Such heavy loads and extended heights of lift impose very heavy strains on the chassis and axles. To help reduce these strains, some machines incorporate pivot steer and articulated rear axles which, of course, also improve the machine's performance on soft ground.

Basically the rough terrain fork lift truck, like its industrial counterpart, is designed for carrying unit loads and palletised goods such as packaged bricks, blocks and standards of timber. It will lift and transport such loads more efficiently than any other machine on a construction site, and will do so with the minimum of labour, without in any way damaging even the most fragile load. The reduction in breakages and wastage of materials, therefore, can be quite considerable even on a small building site.

The savings in labour costs can be even higher. Working single-handed a fork lift truck driver can offload packaged materials from a delivery vehicle, transport them to the site storage area — or, if need be, direct to the various workpoints throughout the site — and neatly stack them to any practical height. Offloading a delivery of, say, 20 tons of packages or palletised bricks would probably take no more than 30-40 minutes, depending on the distance that the truck travels from vehicle to storage (or work) area. The job would thus take only 0.5 or, at most, 0.75 man-hours.

If the same 20 ton delivery were offloaded using manual labour the job would take at least 20 man-hours, up to 40 times greater than the man-hours required when using a RTFL. Working at top speed the average labourer can off-load no more than 1,000 bricks an hour, and towards the

Continued



Benford's Liftmate with body raised for ease of maintenance access.

Continued
end of the day this is likely to drop below 800 an hour.

Experience clearly shows that the incidence of breakages rises in direct ratio to the length of time the labouring team has been working. Hence a team which at the beginning of the day averaged a reasonable 7% breakages might well average 14% breakages by late afternoon — a point which is particularly relevant in the hot, humid climate of West Africa.

The use of fork lift trucks, however, is not confined to unit loads. Virtually all of the machines from the leading manufacturers can be equipped with a remarkably wide range of attachments that greatly increase a machine's usefulness and utilisation. Special purpose lifting attach-



Banford's Liftmate, intended primarily for the construction industry.

ments usually include a log camp for handling rough timber; dumper-loader buckets for handling loose material such as sand, gravel, rock and spoil; skips for transporting and placing concrete; various hoists and crane-type jibs; pipe-handling forks, for lifting land drainage and sewerage pipes; hydraulic powered brick clamps, for lifting unbanded packs of bricks; portable concrete mixers, powered by the RTFL engine; plus hydraulic bale clamps and 180° rotators.

Many machines can also be equipped with backhoe and excavator attachments

The Sambron JAC21, can quickly be converted to a 2 ton dumper with four wheel drive and hydrostatic-mechanised transmission increasing utilisation.



The side tilt carriage of this JCB provides a 12° of tilt — of particular importance for loading and unloading on uneven ground with this facility the problem of locking forks is obviated, yet another factor contributing to safer handling and elimination of damage to materials.



which turn the basic fork lift truck into a light duty trenching and digging machine capable of removing quite a substantial level or spoil. Such attachments are ideal for ditching and pipe laying work.

Most models can be fitted with a hydraulic lorry loader — such as the HIAB — mounted on the rear of the truck, effectively turning the machine into a small mobile crane. This does not interfere with the normal operation of the fork lift mast, which can therefore still accept the full range of special purpose attachments, making it a true general utility machine.

Lack of outreach a basic limitation

One of the basic limitations of the fork lift principle, however, is that it has no outreach. It can lift a load and accurately set it down, but it cannot reach out and place it.

To a limited degree this can be overcome by fitting a pantographic load on the mast. This device pushes the mast forward by about 1.5m enabling it to be placed with considerable accuracy on a second storey landing, though, a machine equipped with such an attachment must be substantially heavier, usually by 35-40% for machines with a standard mast, and up to 50% for machines equipped with extensive outreach.

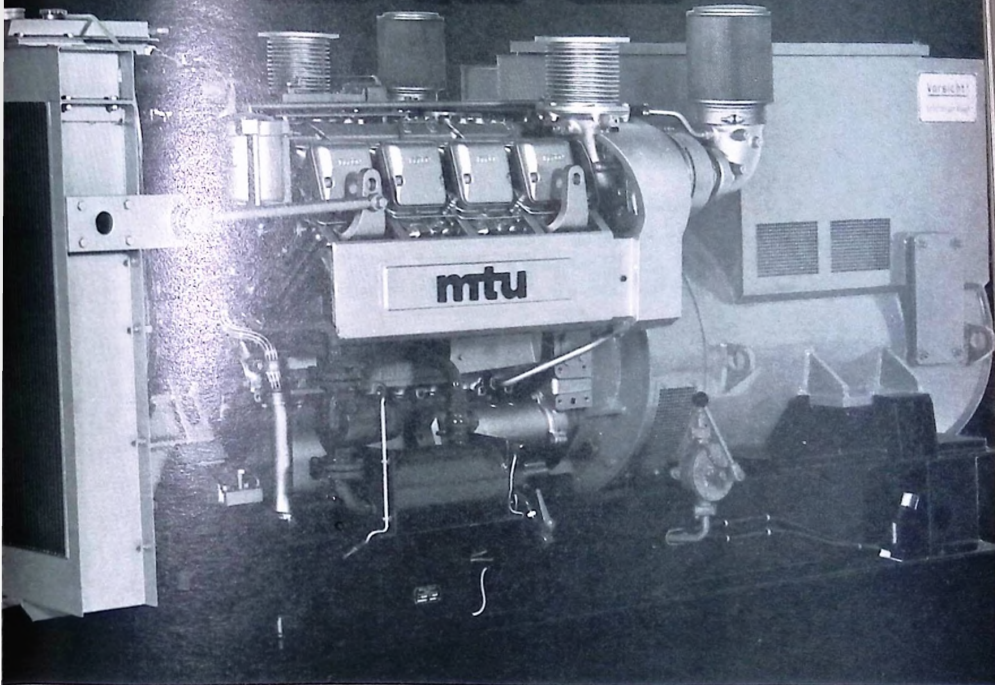
Where outreach is required, maximum capacity are required to reach rough terrain fork lift trucks. In place of the usual fork lift trucks, standard machines, the forklifts have cantilevered, twin by twin arms to which is attached the lifting forks. These machines are, in the main, by the Frey Sambron and by the Pettibone of America.

The Sambron AM 10 has a capacity of 1.5 tonne and a forward reach of 2m, plus a 4.37 m. By fitting a tower mast the machine's forward reach is increased to 2.35 m and its height to 7.16 m.

Pettibone 6-40 has greatest height of r

The Pettibone 6-40 forklift, however, has by far the highest lift of any machines in the world market. It will lift a height of 12.19 m, and has a forward reach of 1.22 m. The 4-wheel drive machine has a wheel steer, including crane

396



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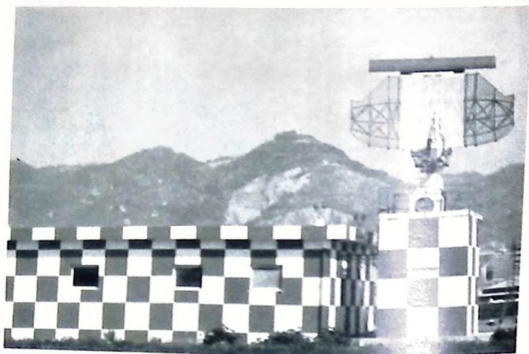
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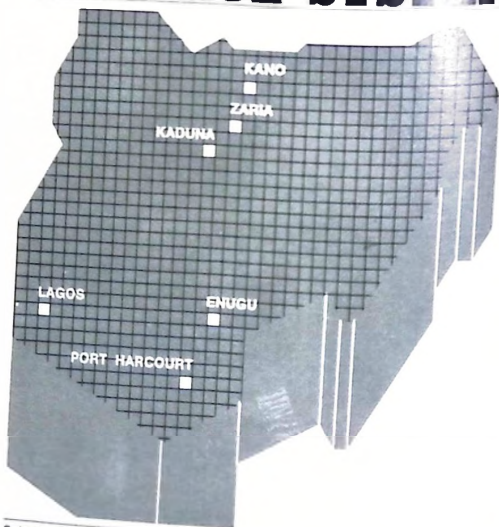
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NIGERIA'S NEW AIR TRAFFIC CONTROL SYSTEM



Selenia, the leading air traffic control radar manufacturer of the Italian IRI/STET Group is presently executing the contract for the supply of a new system that will control the air traffic over the entire Nigerian territory.

The order awarded by the Ministry of Civil Aviation of Nigeria calls for the supply, installation

and commissioning of five dual-channel S-Band terminal radars complete of processing and display systems, which are to be located at Lagos, Kano, Kaduna, Port Harcourt and Enugu.

Another complete radar system is destined to the Ministry's training centre at Zaria.

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nally — an extremely useful facility
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nd, or when manoeuvring on a
ded and cluttered site. All four models
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sway controls which enable the
hine to be tilted 4° left or right to com-
pate for uneven ground.



Jner claim greater flexibility in their
"Giraffe" site placing vehicles fitted
with lifting jibs) a development of the lift.

Recently several manufacturers have produced extended reach machines which have more in common with hydraulic mobile cranes than with rough terrain fork lift trucks, although a fork mast is their standard terminal attachment. A prime example is the new JCB Telescopic Handler which is basically a telescopic boom mounted on a chassis evolved from the design used in JCB's range of excavators. It has a maximum outreach of 3.65 m, at which radius it will handle 0.86 tonne, and a maximum capacity of 2.25 tonne, which it will safely lift to the respectable height of 6.4 m.

It is a front wheel drive, rear wheel steer machine, the same configuration as most fork lift trucks. Like most RTFLs, the JCB can be fitted with a number of special purpose handling attachments, including crane jib, concrete skip and light duty bucket.

A similar machine is produced by the Liner Concrete Machinery Company of



Hyster Pioneer 60 2722 kg capacity lift truck capable of lifting loads of 1.1.3 t to over 9m. Truck is ruggedly designed for use in rough terrain and supply yards.

Gateshead, UK. Called the Giraffe Site Placing Vehicle, it has a pivoted telescopic boom — capable of placing a load 3 storeys high — mounted on a 4-wheel drive, 4-wheel steer chassis incorporating high approach and departure ground clearance angles that help to prevent the machine from becoming snagged on very uneven and deeply rutted ground.

Essentially the Liner Giraffe is a miniature hydraulic mobile crane designed for handling unit and palletised loads. It is, therefore, fitted with an overload protection system as standard, with an automatic cutout should the operator telescope the load beyond the SWL limits. Its range of terminal attachments include a very useful swan neck hook, specifically designed for lifting and placing banded roof trusses.

Forward reach and extended reach machines although extremely useful on site are nevertheless considerably more expensive than the standard unsophisticated, 2-wheel drive, rear-wheel steer rough terrain fork lift truck, and there is little doubt that

this will remain the most popular type for general purpose use on construction sites the world over. Such machines are tough, robust, simple to operate and easy to service, all qualities of crucial importance when machines are working on West African sites far removed from service centres and their teams of factory-trained fitters.

It is unlikely that there will be any radical change in RTFL design over the next few years, other than marginal improvements in operating speeds, height of lift, manoeuvrability and, perhaps, driver comfort.

Design innovation from Manitou

One novel design innovation, however, has just been introduced by Manitou of France who, producing some 5,500 machines a year, claim to be the world's largest manufacturer of rough terrain fork lifts. The new Manitou MB 25P model is equipped with a sliding counterweight, which enables the operator to match his counterbalance to his load.

The counterweight is hydraulically actuated and is controlled from the cab. Thus the operator can move it either to a position right over the rear wheels to give him maximum counterbalance when lifting the maximum load, or he can move it right behind the driving cab, thus reducing the weight over the rear wheels when travelling light over sticky ground.

The MB 25P will lift 2.5 tonne, but Manitou's research shows that the average lift is usually about 1 tonne, which means that most of the time the truck will be travelling with the counterweight approximately in the amidships position increasing the traction on the forward drive wheels (where it is needed) and reducing the weight on the rear wheels, increasing the machine's performance and manoeuvrability on rough terrain.



Manitou's 4RM30H is seen here fitted with the PM7002 loader which gives a horizontal lift capacity of 3.5 t at 2 m radius, and 0.80 t at 7.9 m radius.

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West African CONSTRUCTION



The Magazine within the Magazine

July 1978



A Bonser RT2500K-4 Rough Terrain Truck with lift capacity of 2,500 kgs.

In this issue:

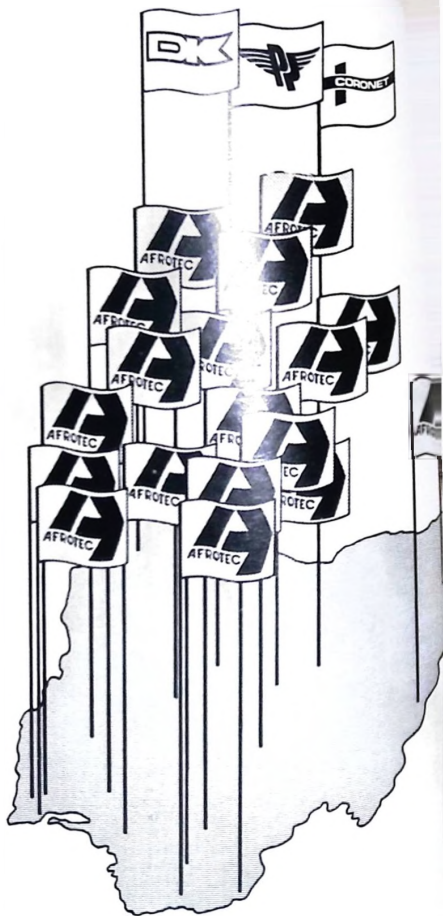
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WITH A LITTLE HELP FROM THEIR FRIENDS

Frederick Parker (contractors plant equipment), Dawson Keith (generating sets) and Coronet (pumps and generating sets) have received the Queens Award for export achievement this year.

Afrotec are proud to be the sole Nigerian agents for these three companies and we feel we can deservedly pat ourselves on the back for playing a major part in their achievement. After all, Nigeria is undoubtedly the largest single contributor to their world-wide exports. Last year British companies exported some £1,000 million worth of goods to Nigeria and Afrotec contributed more than one per cent of this total. Indeed in our actual sector, we contributed about three per cent of the total trade.

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AFROTEC  **MOVES WITH NIGERIA**

viaduct m Raymond Int.

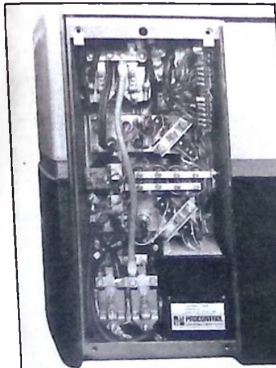
Raymond International has just two paths to build a viaduct some 150 metres inland from Libreville. Spanning flood plain, the 650-metre railway duct, ordered by the Trans-Gabonese authority, must be finished before September and is part of the line being built for the transportation of raw materials, such as manganese and wood, from the interior of Gabon to the coastal ports.

This is the first contract earned out in Gabon by Raymond of the UK, which is transferring piling equipment from Nigeria to the site and importing other materials and equipment from Italy and France as the UK.

The design and construction contract is worth £2m. The job calls for a raising of groups of four piles driven at 30-metre intervals projecting up to 10 metres above ground.

New forklifts from Hyster

The J25-35A series of forklifts is available with a wide range of options to enable dealers to custom-tailor the truck configuration offered for virtually any application. Easy interchangeability of pneumatic, superelastic or cushion tyres means that trucks can be equipped for operation on varying surface conditions. There is a choice of 24 volt or 36 volt power, according to operational requirements. Manual or power steer options are available, and there is a wide range of front-end equipment and attachments. For applications requiring additional battery capacity, the availability of the J30AS in two frame sizes gives the necessary flexibility.



Procontrol, proportional control system is a unique SCR electronic controller which has been developed exclusively for Hyster's three-wheel electric. Procontrol controls each drive motor independently at all times, proportioning the right amount of power to each drive wheel at the right time.

Growing orders for Steelwork

Orders for structural steelwork were reported by the BCSA (British Constructional Steelwork Association) to amount to 4776 tonnes a total of 23 orders for the first quarter of 1978. Among the largest individual orders five were recorded in Nigeria. For the year 1977 45% of orders by volume were taken in OPEC and non-OPEC Arab-speaking countries, combined with figures for Iran and Nigeria this proportion exceeds 60%. Recent major steelwork orders include 715 tonnes for pumping stations in Nigeria.

An extract from orders reported by BCSA for 1977

Country	Number of orders	Tonnage	Percentage of total
Nigeria	12	3,029	8.2
Liberia	1	13	.05
Sierre Leone	1	33	.1
Zaire	1	431	1.1

Good year for Blackwood Hodge

The performance of Blackwood Hodge (Nigeria) Ltd for the financial year ending Dec 31st 1977 showed a 19% rise in turnover compared with 1976. Turnover stood at ₦40.2m at the end of December 1977, against ₦32.7m for the previous year, and profit before tax rose from ₦6,505m (1976) to ₦8,425m for 1977.

Cement production grows

The Shagamu Cement Works owned by the West African Portland Cement has expanded its annual production capacity of cement from 600,000 tonnes to 1,000,000 metric tonnes. This was announced during the opening of the company's new complex by the Federal Commissioner for Industries Dr R A Adeleye.

Dr Adeleye pointed out that various attempts have been made to estimate Nigeria's demand for cement in the next few years. During the current year it is estimated that 5.4m tonnes will be consumed. Of this figure only 2.4m will be produced locally. By 1980, the commissioner said that total demand would be about 6.3m tonnes and with the planned expansion of plants at Nkalagu, Ukpilla, Calabar and Sokoto the forecast estimates imports of about 2.3m tonnes of cement to augment local production.

Sambron launch multi-purpose handler

Sambron have announced radical improvements and updating of their popular AM10 jacklift, and at the same time have

introduced a new multi-purpose handler, the J24S. This dual move again extends their lead over competitors in these sectors of the rough terrain handling equipment market.

The AM10 with the unique overhead arm configuration, captured imagination of the building and construction industry. As a loading out tool it is still unique. With the ability to load out hydraulically onto scaffolding, without the need to move the machine, a feature of paramount importance in these days of need for efficiency coupled with safety.

The AM10 has now received a total heart and lung transplant. Now fitted with the Perkins AD3152 engine, giving 14% increased horse-power; a proven Borg Warner all synchromesh four speed gear box; a new duty drive axle with enclosed dry disc brakes; differential lock on front drive axle; and improved road speed to 17 mph, lift height of 7.9 metres, and a vital forward reach element of 2 metres along with a low transport height. The cab area has also been redesigned and styled for greater operator comfort and protection.



The introduction of the JAC24 in 1975, represented an advance towards a purpose designed, multi-purpose handler. Growing sales success has convinced Sambron that the multi-purpose concept is gathering support and that this type of machine, although ahead of its time, is in demand today, and encouraged the company to develop the new, much improved and more powerful J24S.

The main improvement is the installation of a 3 cylinder Deutz engine delivering 38 kw (52HP DIN), increasing power available by a massive 33%. The hydrostatic mechanical transmission has also been totally changed. The highly efficient and well proven Rexroth — Hydromatix system with variable displacement pump and motor, has now been adopted. This, while delivering more power to the wheels, has dramatically increased road speed to 17 mph useful for split site work.

The customer can choose from a huge range of attachments allowing the J24S to perform every handling job on site. To site strip, to load lorries, to dig footings and trenches, to back fill, to offload, distribute and load out all site materials, to pour concrete, to rehandle loose materials.

CONSTRUCTION EQUIPMENT

— A Buyer's Market

BUYERS OF construction equipment in West Africa have never had it so good. At present the market is theirs to pick and choose as the major construction equipment manufacturers face growing numbers of problems 'at home'.

According to a report from the BIPE market research organisation, international trade in construction equipment will grow at an average annual rate of 8 per cent in the years to 1985 compared with a 6 per cent growth expected for total trade, despite this optimistic report the picture in Europe is depressing. In the 18 months to the end of 1977, UK construction equipment manufacturers saw no growth in demand for their products and output stayed at \$1440m. The French claim production has fallen by 7 per cent from the 1976 level to approximately \$1440m, and the West Germans complain that the Deutsche Mark is so highly valued, compared with other currencies, that exporting is difficult. However they have maintained an output of \$2.46bn.

Competition is fierce

In the face of an almost dead home market, Europeans have been exporting on an unprecedented scale; consequently competition is fierce, and not just amongst the Europeans. In the USA, Caterpillar who have 50% of total world sales, pushed up their sales outside the US only slightly, from \$2.945bn to \$2.966bn and Komatsu of Japan second in the league, only managed a modest 5.2% increase.

Of all international companies perhaps Massey-Ferguson is the best indicator of

the present situation, with an estimated loss of \$60m on construction equipment last year. At present the company is carrying out investigations to assess the exact losses, but this is not easy due to the high degree of integration of manufacturing and marketing operations for farm and construction machinery lines. Massey-Ferguson's two French companies have just announced that more than 10% of their work force will be made redundant because of the continuing losses and failure of the European market to pick up. Most other manufacturers have also been in this position, shedding staff over the last 12 months. The results will be of considerable importance to the European manufacturers as the heart of Massey-Ferguson's operations are based in central Europe, at Hanover. None of M-F's competitors however, believe that a complete shut-down of the construction equipment business is likely, for the cumulative impact would be considerable both politically and economically. The closure of a major group would obviously make a considerable difference to the over-capacity problems within the industry, but it is thought debatable whether it would stop the formation of new multi-nationals which have changed the face of the construction industry during the last 15 years.

The Committee for European Construction Equipment (CECE) has pointed out that although the US is a major producer it only exports a relatively low percentage of its production. Europe therefore forms the world's major exporter, with an output of \$.4bn, however this turnover must be shared among 800 manufacturers and it is difficult for most to compete with the major

groups in terms of research and development. For instance, the CECE annual \$9m on R&D whereas Massey-Ferguson spends around \$28m and Komatsu \$0.4m.

There is an additional threat on the European construction horizon, namely the prospect of setting up either in the UK, Netherlands or West Germany. This is to be taken at the end of the year and has already met with opposition. The Japanese have entered a market where they are entering down price structures, and they enter a market and bring in a considerably lower return. It is possible that if Europe does not let Komatsu simply set up in the UK, it will export and from there, the Japanese seem from the fact that they are making roads into most leading nations, but at the same time making it difficult for exporters to Japan.

Growth rate slackens in West Africa

Although demand in West Africa, Middle East and other developing areas still remains fairly strong the growth rate has definitely slackened off and this has limited the surplus equipment that can be absorbed. For the West Africa, however, it is good news in the short term, for the most cases receive better overall value for a far wider selection of better quality equipment, which is specially designed and adapted to his local conditions. However in the long term an unhealthy construction equipment industry will be harmful to everyone.

Some Leading Manufacturers and Their Products

	Backhoe loaders	Crawler loaders	Wheeled loaders	Hydraulic excavators	Heavy dump trucks	Graders	Scraper
Caterpillar		•	•	•	•	•	•
Komatsu		•	•	•	•	•	•
Case/Poclair	•	•	•	•	•	•	•
John Deere	•	•	•	•	•	•	•
Massey-Ferguson	•	•	•	•	•	•	•
Int'l Harvester	•	•	•	•	•	•	•
Ford	•		•	•		•	•
Clark							
General Motors					•	•	•
Fiat-Allis	•	•	•	•	•	•	•
Volvo	•		•	•	•	•	•
Orenstein & Koppel			•	•	•	•	•
Liebherr		•	•	•	•	•	•
Euclid/Diamler-Benz					•	•	•
J. C. Bamford	•	•	•	•		•	•
Layland		•	•	•	•	•	•
Hymac (Powell Duffryn)	•			•			
Priestman (Arcrow)				•			

This table is only an approximation, but does give a clear indication of the competition situation in each sector. Within each sector there is a wide range of products so companies manufacturing a heavier machine will not be competing directly against a company marketing smaller equipment.



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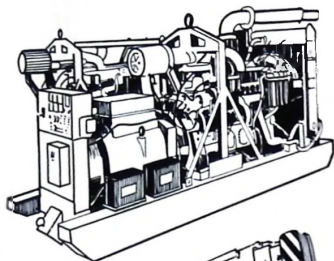
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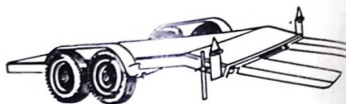
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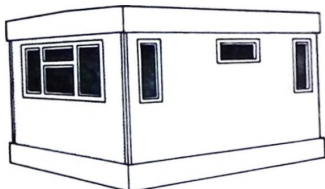
MOBILE CRANES



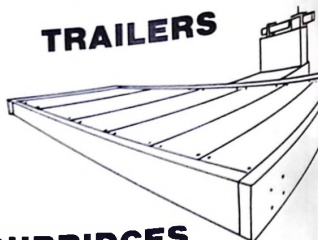
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Foreign finances Construction of road in 3 neighbours

Nigeria is financing the construction of a 366 km. long joining three border countries, Benin, Cameroon and Niger. The FMG wishes to develop international road links in order to encourage transport, travel and co-operation with this in mind, several international roads have been developed beyond Nigerian borders in neighbouring countries, the main ones being sections of the Trans-African highway (Lagos-Mombassa), the Trans-Sahara road (Lagos-Algiers) and the trans-West African Highway (Dakar-Lagos-Dakar) which are in various stages of completion.

Contract news . . .

The Federal Housing Authority is to award new contracts for the housing development at FESTAC town. 10,000 houses, scheduled for construction by early 1977, are still unfinished. According to the FMA general manager, only two of the six original contractors — Warner and Warner and Worldwide — are still working on the site.

Kaduna State Housing Authority has awarded two contracts for the construction of roads and sewage systems at Barnawa Housing Estate. Lee Fakino Nigeria secured a N32.2m. contract for the road network, and the sewage contract, N13.2m., was awarded to Bayajide Construction Company.

A N7.4m contract for Umuahia township road project has been signed in Owerri by the Imo State Commissioner for Works and Housing, Dr. M. A. Mwechukwu, on behalf of the government, and the managing director of Fougerolle Nigeria Ltd.

A contract worth N43m has been awarded to Julius Berger for the construction of a new bridge to replace the old Carter Bridge.

A contract worth N6.7m. for building offices and a warehouse for New Nigeria Newspapers has been signed in Kaduna with Arewa Construction Limited.

The N150m Benue Cement Factory in Yander is to go into production in June 1979. The factory is to produce 90,000 tonnes of cement annually and will employ about 500 workers.

A N7.4m contract for Umuahia township road projects has been signed in Owerri by the Imo State Commissioner for Works and Housing and the Managing Director of Fougerolle Nigeria Ltd.

The Kaduna State Government has awarded a N2.9m contract to Lee Fakino Ltd for the construction of roads at Barnawa. The project is to be completed in 12 months.

DEVELOPMENTS IN WEST AFRICAN ROAD CONSTRUCTION WORK COMPLETED OR UNDER WAY AND MAJOR PROJECTS

Country	Roads under construction	Paved	Useable all year	Useable seasonally	Roads finished 1975	Chief roads finished or in progress since 1970 and major international connections to be completed by 1980.
BENIN	5,900	500	3,500	1,500	25,120	Development of the road network to Togo and Nigeria.
CAMEROON	40,000	2,100	5,000	7,000	73,000	Road link with the Transcameroonais.
IVORY COAST	44,720(1)	2,380(1)	23,000	9,000	133,000	1) Includes urban road system. Works under way: 180 km of motorway and paved roads; re-inforcement of 200 km of resurfaced roads; improvement of 1,800 km of earth roads and 10,000 km of bridlepath; next plan: 150 km of resurfaced roads.
GABON	6,800	315	2,800	2,200	20,975	Transports made up 40-50% of heavy vehicles (often over 18t).
THE GAMBIA	1,500	144	258	800	5,800	The Five Year Plan 1976-80 foresees links with Senegal and Guinea, branch of the trans-African road from Dakar to Lagos.
LIBERIA	7,200	320	1,880	2,500	27,800	In the five years to come, construction of 136 km of paved roads and 400 km of roads useable all year as well as 4,200 m of works.
MALI	13,004	1,654	5,042	5,595	18,500	Plan 1974-78: 1,567 km paved; 1,300 km modern roads; 2,358 km under study.
MAURITANIA	7,300	680	520	2,800	10,850	Under construction; Nouakchott-Atar and Trans-African to Aïo and Atrous.
NIGERIA	94,000	11,000	18,000	31,000	276,000	3rd Plan 1975-80: Express roads for sections unless the traffic is over 5,000 vehicles a day; transafrican (220 km) completed in 1977 links with Niger and Cameroon completed in 1980.
CHAD	27,512	253	4,385	7,802	11,535	Improvement foreseen of 1,032 km including Guelendeng-Sarb (117 km), Ndjamena-Abche (884 km) and Guelendeng-Lai (231 km).
TOGO	7,100	250	1,750	5,000	17,046	Construction of the road between Lome and Atakpamé.
UPPER VOLTA	18,000	800	3,900	8,000	17,400	Completion of the resurfaced road to Abidjon, Transafrican road: Koupella-Fada (90 km) towards Niger; Ouagadougou-Yako (107 km) towards Mali.
SENEGAL	13,800	1,300	2,000	6,000	70,547	Completion of the Senegambia and the road towards Mali (between Tambacounda and Kayes).



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CAT PLUS services – a total support system to help you get the best return from your lift truck investment.

Additionally, routine maintenance is so simple on Caterpillar lift trucks that it will get done. They're designed with a minimum of check points – grouped together where possible for quick access. Saves you money in the long term.

So before you make your investment, consider the total picture – the *right* truck with *low total* cost.

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
1,000 to 27,300 kg. capacities. Electric, diesel, petrol or LP gas power. And all with excellent local parts availability and service.

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Sierra Leone: Tractor & Equipment, Division of UAC of Sierra Leone Ltd., P.O. Box 127, Freetown, Tel: 2807. Liberia: Liberia Tractor & Equipment Co., P.O. Box 299, Monrovia, Tel: 22279.



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Percussion drilling is stated to be more precise, faster and more efficient than with conventional mechanical rigs and maintenance is considerably simpler as there are no vulnerable chains or open gear trains. Smooth operation is achieved by the rig's efficient spudding action through a clutch-operated worm-and-wheel gear from the power plant. A rubber-cushioned shock absorber at the crown sheave provides recoil action from the top of the mast. Reels for the drilling, casing and sand-bailing lines are operated by low-speed, high-torque hydraulic motors and worm-and-wheel reduction gearboxes. Normal percussion speed is 1800 rev/min giving 60 strokes/min., and drilling capacity is 100-900mm diameter holes down to depths of 300m.

Concrete sealer and adhesive

Geomarseal — an adhesive and sealer suitable for bonding new concrete to old — is the first of the range of epoxy compounds marketed by Structoplast Ltd., to be available in an easy-to-use 'Squish' pack which uses a restricted throat and temporary foldover technique to prevent intermixing of the two liquids prior to their use.



Suitable for use by the building trade or by the DIY enthusiast, the 'Squish' pack eliminates all site errors caused by mixing the wrong proportions of two-part chemicals — it also ensures thorough mixing before they leave the container. Working time once the compounds have

been mixed is between 45 and 60 minutes.

An epoxy resin/hardener compound. Geomarseal has low viscosity, good rate of spread and exceptional qualities of penetration into the surfaces of concrete substrata, and for filling cracks, penetration ensures that even the minutest crack is filled.

Paurat trench cutting machine

The Paurat Trench Cutting Machine has been developed specifically to provide an answer to the problem of large-scale trenching in rock. The effectiveness of the answer can be judged from a typical installation of a Paurat machine in Libya, where the machine replaced 50 jack-hammers. The cost per cubic metre extracted has been reduced by 50 per cent, and the estimated time for completion of the trenching part of the contract has been reduced from 12 years to 18 months.



The manufacturers of the machine, Paurat GmbH, are specialists in tunnelling machines and heading machines for mines, and the same principles of know-how of rock cutting embodies in the company's underground machines have been brought to the trench cutting problem. The focal point of the machine is a spud-shaped rotary cutting head mounting an array of carbide-tipped picks. The flanks of the array are formed by the edges of a two-start hardened steel spiral. The cutting action of the head is performed by thrusting it axially into the rock (or 'sumping in'), at which time most of the work is done by the picks on the tip of the head, then moving the head laterally so that the side of the array attacks the rock and the cuttings are removed by the spiral vanes.

hydraulic crawler rig

Tamrock Division of Oyempella Ab has introduced a series of hydraulic crawler rigs. The series includes seven different models which are based on components used on Tamrock's eumatic crawler rigs and hydraulic tunnelling jumbos. The advantages of hydraulic face drilling rigs are very much the same as those of Tamrock's other hydraulic equipment; for example, efficiency, low running costs, operator comfort, economy, low-pressure hydraulics, and automatics etc. However, one of their most important features is their independence of compressor, which gives them considerable mobility over rough terrain.



Because the Condor Septic Tank is prefabricated, installation can be usually completed in a matter of hours, even by unskilled labour. The tank itself has no moving parts to maintain and the specially designed interior provides free movement of effluent, thereby avoiding 'dead' areas and ensuring maximum capacity.

After installation, apart from the periodic emptying, no other maintenance is required throughout the unit's long life. There are three sizes of tank available to suit most requirements: 3000, 4500 and 6000 litres.

Rapid drilling of water holes

A hydraulically driven water drilling rig from Farrrods International Ltd. features an inter-changeable drive system so that it can be used both for percussion and rotary operations to bore straight through different strata. Change-over from one system to the other is stated to take only minutes. Compared with other rigs, the Hydrorig 600 is simpler to maintain and is said to cut down time by some 50%.

On site, the rig can be used in the percussive mode to bore through loose strata so that casing tube can be inserted without danger of the hole collapsing or straying from its appointed course. As soon as the rock head is reached and open drilling can start, the rig is changed over to the rotary mode.



Tamrock's hydraulic crawler drills are designed for benching in medium-sized open pits and quarries, and in the construction industry drilling on road and railway cuts, building foundations and power station work sites. They are best suited to bench heights under 15 metres. Their range of applications is considerable. They excel when drilling holes between 35mm and 64mm diameter, and they can drill holes up to 102mm in diameter.

Prefabricated septic tanks

The quick, economic and uncomplicated installation of the prefabricated Condor Septic Tank has made it an ideal choice for those involved in projects, where reliable domestic sewage treatment is required.

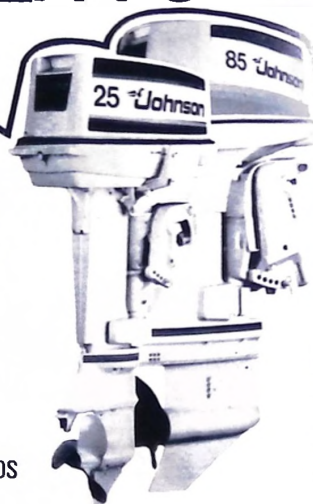
The unit is manufactured by Conder Hardware Limited. It is made from tough glass-reinforced polyester and is suitable for all stable ground

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"The architecture grows much like a plant conditioned by the readily available raw materials". A drawing by Chinedum Ekeh.

WOODEN

Wood is one of West Africa's most important exports, forming an endless list of varieties suited to a wide range of tasks. In this article Noel Moffett looks at developments that have taken place in timber technology and some of the problems facing future developments in West Africa

"WEST AFRICAN hardwoods protect our coastline, make cradles and coffins, provide lifelong floors, frame lorries and buses, are used in jetties, boats, ships, acid vats, furniture, sleepers, TV cabinets, beams, . . . afzelia, agba, cottonwood, iroko, obeche, opepe, Sapelwood, . . . cordia as an exterior, almost knot-free joinery and cladding timber; yellow ayan for hardwareing structural use; white sterculia for blockboard; cottonwood, light and soft; okan, durable and tough; sapele, dark and beautiful. The list is almost endless and is proof that West Africa can provide the right wood for the right job, however gruelling the task." It can indeed. Good advertising this for one of West Africa's most important exports.

And therein lies a curious anomaly. As a building material — for structural or decorative use — West Africa exports her hardwood and converts her softwood to blockboard or plywood and exports it too. She is obliged to; her climate, her insects

and her fungi make the extensive home use of timber well nigh impossible.

Before we try to find out if anything can be done to change this state of affairs we must have a quick look at Japan and Finland: for the Japanese are the great respecters of trees and timber and have a lot to teach the rest of the world, including West Africa, on that subject; and the Finns have developed an exciting timber technology and built some splendid timber buildings.

WEST AFRICAN CONSTRUCTION

As in West Africa's coastal belt, every hill and almost every mountain in Japan are covered with forest. Although pine and bamboo are the commonest and the most used of her woods, it is said that there are 1,000 other varieties, among them two — hinoki and sawara — which have the rare property of resisting both damp and considerable heat. In the country areas the

sides of rectangular bath-tubs are made from hinoki planks with right-angular, waterproof, glued butt-joints (without mortice, tenon, dowel or dove-tail) and the water is heated to near boiling point by a charcoal brazier underneath.

Wood has always been regarded in Japan as a living thing, with feelings, susceptibilities and preferences, and it is rare, even today, to find carpenters using nails, screws or other barbaric instruments of torture. Because of this attitude the design of the joint between two wood members becomes especially significant. The carpenter is indeed the most important man in the building industry and his skill is often quite remarkable; an otherwise illiterate village carpenter can be a master craftsman capable of joining timbers together in a manner beyond the capability of anyone in the UK since the Georgian era.

Paint is rarely used, woods being

Continued

Continued

selected for their decorative as well as for their structural qualities. Wood surfaces are sometimes treated with a transparent, colourless preservative, but it is more usual to keep them scrupulously clean; even the floors of oft-visited temples are cleaner than our kitchen tables.

This cult of cleanliness seems to have stemmed from Japan's primitive religion Shinto which found in wood an ideal material and gave it impressive expression, both in the construction of its temples and in that minor architectural masterpiece the traditional Japanese house. Shinto temples use cedar dramatically, merging structure and decoration in one forceful architectural statement, and preferring to rebuild even the oldest temples every twenty years or so, to the same design, rather than apply paint or other preservative, just as a Yoruba or Ibo bush artist today copies exactly the hardwood ceremonial mask carved by his ancestors. Roofs are usually covered with tiny cedar shingles and rafters carried up well above the ridge.

The Japanese house

The design of the Japanese house was the result of clear, logical thinking both in plan and in section, of a direct, functional use of three materials — wood, stone and plaster — and of fine craftsmanship. The concern of the designer was always how best to protect the user of the building from the vicissitudes of a diverse, temperamental and sometimes cruel climate — not unlike that of West Africa's coastal areas.

The design is essentially flexible. Post and beam construction enables walls to consist of sliding panels — of hardwood and glass in winter, of softwood and translucent mulberry-paper in summer. These shoji are exceedingly light (battens are 9mm by 3mm cedar on a 100 by 200 grid) and slide at the touch of a finger. Thus they act at the same time as walls, partitions, doors and windows. Their use makes maximum flexibility in the organisation of space possible, creates a soft, diffused light in all areas and, even in the

humblest dwellings, provides an admirable background for gracious family living.

The interior of a Japanese temple or house is the proof of Lao Tse's 500 BC dictum: it is not a series of rooms divided from one another by walls, partitions and doors; it is rather one large "space within to be lived in", a space sub-divided at will in many different ways.

Timber technology and Finland

Finland too is a land of great forests. A bewildering variety of pine, fir, spruce, larch and birch has given her architects, scientists and businessmen opportunities to develop timber technology to an advanced stage which is today the admiration of the world.

It was Scandinavian snow, ice and frost which underlined both the strengths and the weaknesses of wood as a material. It is tough, strong and fibrous; it withstands heavy loads and strong pressure when these are applied across the grain; but it splits easily along its fibrous channels — as a kind of mute complaint at having its protective bark removed. It was the realisation of these strengths and weaknesses which led the Swedes and the Finns to invent and develop plywood. And plywood was to make them prosperous and to transform the building industry.

Plywood results from glueing and squeezing together under strong pressure very thin laminations of wood, with each grain laid at right angles to the next. If an attractive grain finish is required a single thin veneer of the selected wood is applied as the last lamination.

It was the invention of plywood and other composite wood derivatives — chipboard, blockboard, insulating board — which rescued wood from its restricted-use reputation and give it a very wide application and a ubiquitous use. It is probably true to say that today plywood is to be found on every building site and blockboard in every furniture factory.

So the Finns are both wood lovers and experimenters in wood technology. And it



The oldest door-posts and veneer date from the turn of the century. Ilorin in Nigeria was carved in the Guide to the Nigerian Museum, Lagos.

is wood which has given them and their designers world-wide fame and made a visit to Finland a must. For Finland is one of the few countries where good modern architecture is the rule rather than the exception. I remember with particular pleasure upon rows of small timber houses, neat and tidy and well-detailed, a brand new summerhouse at a lakeside, framed by tall silver birches and smooth, curved rocks, already unobtrusively into its wild setting. A little civic centre at Saynatsalo, a remote farming community for a remote farming community, beautiful, splayed, pine roof trusses ing out over the councillors' house, grass-grown larch steps leading down in the forest: a row of stools of the staff bar counter at Jyväskylä University which demonstrates the functional, convincing application of modern technology; a sports building, enormous trusses, at least 3 metres looking solid and safe and reminding athletes that the forest is only half away.

Trouble with termites

West Africa's coastal region is miles long, from Gambia to Gabon, covered almost entirely by dense, tropical forest containing some of the finest timber in the world. It was understandable that the splendid tradition of building in



"A brand new summerhouse at a lakeside, framed by tall silver birches and smooth curved rocks, already slotted unobtrusively into 'its wild setting' (from *Suomi Rakentaa* Finland bygger).



Our windows have already weathered some of the most severe economic climates.

Recently, Britain has suffered a very large number of economic traumas.

Happily for Alcan, they've made Weathergard Mk. II aluminium windows one of the best-selling ranges on the British market.

The reason is simply that, in an inflationary economy, our windows are the most economical. Because once they're installed, they won't need replacing.

Being Alcan, this is partly due to the aluminium we use. However, it's also due to the way we put our windows together.

For maximum strength, they have frames with clenched mitred corners. To eliminate wear,

they have very deep cills that keep out dirt and grit.

And to keep out the hottest, coldest or wettest weather, they have synthetic rubber, p.v.c. and polypropylene seals. These are particularly resistant to rotting and shrinking.

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And to prove that they'll perform as perfectly as we claim, all our windows carry certificates of severe rating from the British Standards Institute.

The Alcan Weathergard Mk. II range includes top hung, horizontal sliding and vertical sliding windows, and patio doors. All available in standard sizes or made to measure, and in four finishes.

In return for the coupon, we'll send you a complete guide to our range. Having weathered Britain's economy, it'll weather any climate.

At about 2mm thick, our aluminium is stronger than in many other windows.

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
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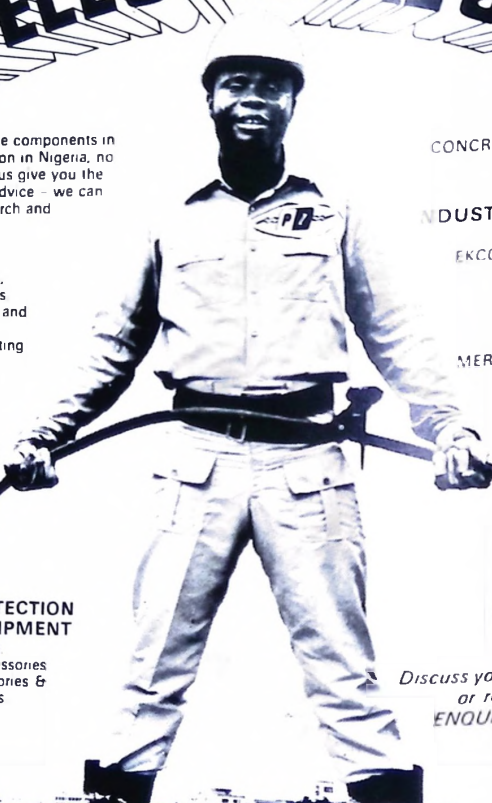
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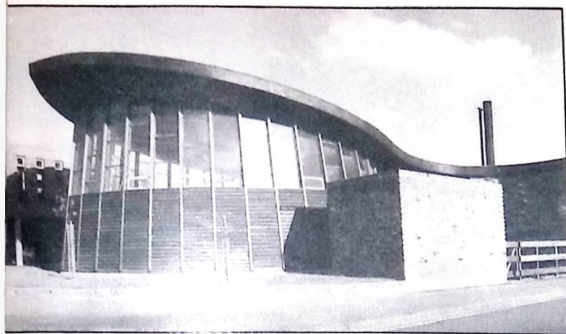
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"Today wood successfully competes with steel, aluminum and reinforced concrete as a structural element in modern architecture." A school assembly hall. (Acknowledgement: Architects Alina and Noel Mofkoff)

Continued
 would have evolved from very early times and that a series of architectural styles would have emerged expressive of the tradition and based on the use of materials immediately to hand in each locality — reeds, clay, wood and, occasionally, stone. Writing recently in SHELTU, AFRICAPS, the journal of the University of Nigeria at Enugu, Chinedum Ekeke described indigenous Igbo architecture like this:

"The architecture grew much like a plant conditioned by the readily available raw materials. The major walling material is the tough brown earth which is dried, watered and kneaded, then rolled into lumps ready for site work.

Other items include:
 Abazo —



"A row of stools...which demonstrates the direct functional, convincing application of modern technology." (from 'Modern Scandinavian Furniture' by Ulf of Segerstad)

Timber column with forked ends to carry the cross beams.

Azu —

Timber stakes used as framework

Mboro —

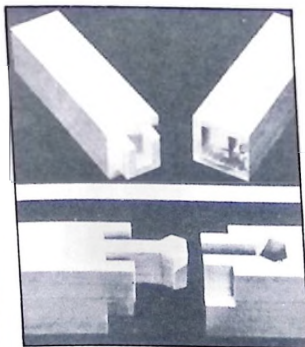
Very hard wood which serves both as cross beam and wall plate.

Owa —



Rafia palm fronds used as rafters and purlins. Bamboo is also used here.

Akwara and Ekere —both obtained from raffia palm offer highly durable rope.



"Because of this attitude (of respect for wood) the design of the joint becomes especially significant" (from 'Art of Japanese Joinery' by Kiyosi Seike)

materials for effecting joints and fastening members together."

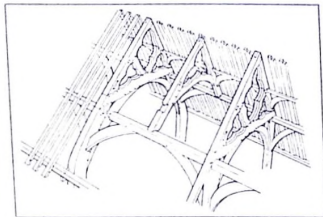
It is very sad and perhaps ironic that West Africa's fine tradition of indigenous timber building should today be in danger of extinction, partly because of her understandable desire to live in the modern world and take advantage of the technology it offers and partly — anachronistically — because of the behaviour of one tiny insect the termite.

It is true that buildings with wood walls

and wood-framed thatched roofs are still being built along the banks of the Volta, the Niger and the Benue, but most of them are built on wood posts rising from the water itself. They are built thus because the water prevents the termites from attacking and destroying the timber. It is also true that wood framing for mud walls is still used, but it rots easily and is continually attacked by fungi and insects and must be constantly repaired and renewed.

There are many species of termite but two main types which attack buildings: the sub-terrestrial type, which lives in the ground, and the dry-wood type, which lives in the timber itself. Both feed voraciously on structural timber and wood furniture.

95% of all termite damage to timber in buildings is done by the sub-terrestrial type which, amazingly, has so far withstood all attempts to exterminate it. It attacks timber in or on the ground; it builds tunnels of earth across other materials to reach timber in buildings; it builds in cracks in badly laid concrete; it constructs unsupported tubes in order to reach timber near the ground. Nothing seems to stop it. Extraordinary that a tiny white ant could have wrecked such havoc with wood of quality and beauty and destroyed countless numbers of magnificent carved hardwood doors and door-posts, columns and totem-poles. The oldest exhibits in Lagos' fine Nigerian Museum date from the turn of the century. No doubt the little termite will one day be vanquished: for the moment he remains the most powerful force in West Africa's huge world of wood.

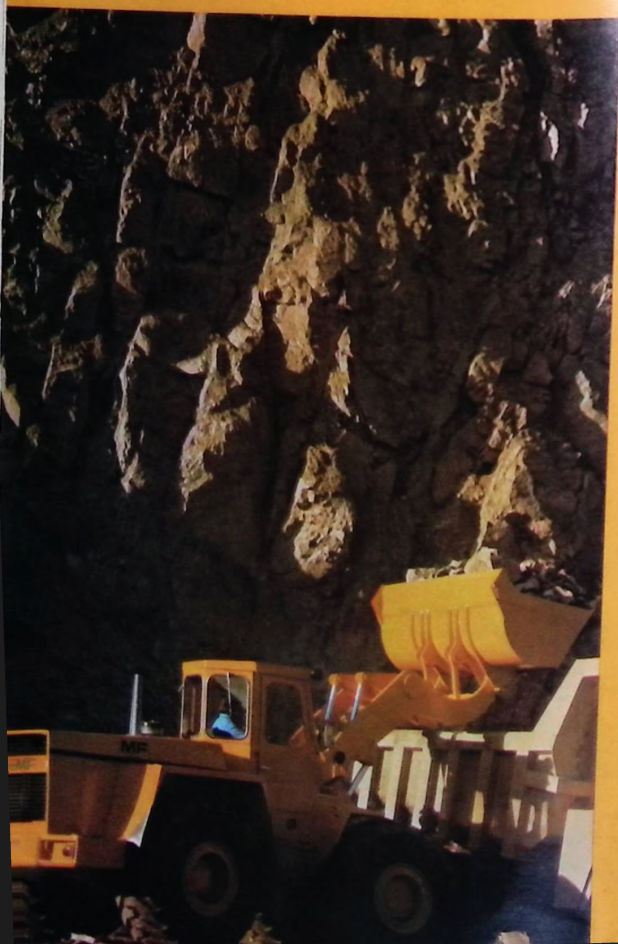


"... to carry the roofs of churches, public buildings and great country houses over wide spans" (from Architectural Association library bibliography)

Actually it is possible to prevent the termite from carrying out his aggressive, destructive intentions. But the measures which must be taken are elaborate and expensive. Drywood termite infestation can be prevented by treating each individual piece of timber, before use, with pressure-impregnated preservative (surface application of preservative is ineffective). Infestation by subterranean termites can be prevented in three ways: by putting all accommodation at first floor level or higher, on steel or reinforced concrete columns; by poisoning the soil under and around the building mechanically and chemically; or by careful detailing to ensure that no wood structural member, built-in fitting or piece of furniture touches the ground. It is perhaps understandable that most

Continued

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MF 55C	144	1.9 - 3.0 m ³
MF 66C	210	3.0 - 5.3 m ³
MF 77C	258	3.85 - 7.2 m ³

MF

used
 (ects, on behalf of their clients, prefer
 other materials. The termite is still
 master.

Structure

free from the worries of termite and
 decay, Europe has turned her
 timber to good use. But at times she
 cope with other less voracious but
 ally determined attackers of timber —
 rot and the death-watch beetle. In spite
 them however England's Elizabethan
 k stood up to centuries of stormy seas
 d brought her tea and spices from India
 d Ceylon; Elizabeth's sturdy burghers
 rred the oak framework of their half-
 mbered houses to such good effect that
 any of them are still lived in and
 ren. Hawksmoor and Inigo Jones used
 ak and elm as column, beam and truss
 to carry the roofs of churches, public
 buildings and great country houses
 over wide spans. Spain's pine and
 spruce withstood attack by pirate,
 privateer and the bay of Biscay and filled
 Isabella's coffers with Portuguese gold.
 Gunnar Asplund and Alvaro Siza invented
 new uses for Scandinavian pine wood,
 to cover the roofs of Olympic stadia and give
 her housewives the most elegant furniture
 since Louis XV — at one-tenth of the cost.

Today wood successfully competes with
 steel, aluminium and reinforced concrete as
 a structural element in modern architecture.
 Every major country has its Timber
 Development Association which seeks to
 make the structural capabilities and attractive
 qualities of the material better known
 and encourages new uses for it and its
 derivatives. In Canada and the USA
 particularly timber engineering research
 was stimulated, during the immediate post-
 war era, by the need to divert steel supplies
 to the manufacture of machinery and
 armaments. In north America structural
 timber is today being used on an unprece-
 dented scale for aeroplane hangers, ship-
 yards, railway and motorway bridges,
 dockyards, aircraft, ships, barges railway
 sheds and industrial plants of all kind.

One wonders how long it will be able to



"West Africa's coastal region is... covered almost entirely by dense tropical forest" (Map from *Timbers of West Africa* by B. Alwyn Jay)

hold its own, as a structural material,
 against increasing opposition from the
 steel, aluminium and plastics industries.

From the earliest times artists have been
 attracted to wood because of its availability
 and also because of its workability.
 Sculptors especially have been fascinated

by icons; crosses and crucifixes of stark
 simplicity and rococo richness.

Carved hardwood fills the world's
 churches, preaches the true faith to
 Christian, Muslim and Mohammedan alike
 and enriches the lives of presidents and
 peasants the world over.

...structural
 timber is
 to-day being
 used on an
 unprecedented
 scale for ...
 dockyards ...
 railway sheds
 and industrial plants
 of all kinds
 (from ARCHITECTS'
 Yearbook 2)



and inspired by its texture, its density, its
 grain and the liveliness of its fabric and
 have used it to create many of the world's
 finest works of art; sensual pagan
 fetiches; Igbo and Yoruba ceremonial
 masks; Canadian giant totem poles; Polish
 primitive shrines and sophisticated toys;
 Spanish fletas; German triptichs

Many people regard wood as the most
 attractive of all the natural materials used
 in building. Certainly some of West
 Africa's hardwoods have a striking beauty
 — from the delicate, light softness of
 cottonwood to the hard, dark, silken sheen
 of sapele mahogany. But it is said that
 the high cost of felling, transport, marketing
 and manufacture has almost restricted their
 use, in their solid form, to company
 boardrooms and company directors' living-
 rooms.

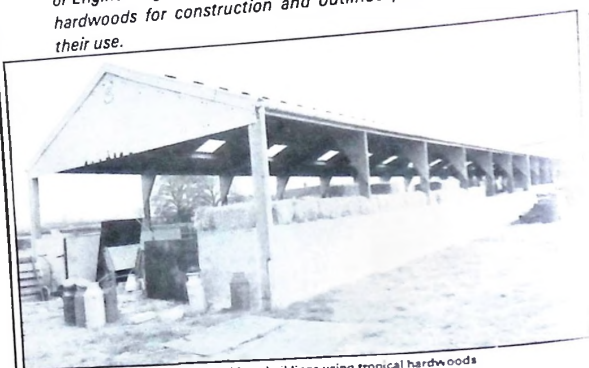
But modern technology has come to the
 rescue. Developments in finishes, pre-
 servatives, gluing and laminating
 processes have not only enhanced the
 natural attributes of hardwood and widened
 its range of use, they have also greatly
 reduced its cost. Veneering is now found
 everywhere and a veneer of every known
 hardwood can be obtained at a fraction of
 the cost of the same wood in solid form. If
 the veneer is cut from a carefully selected
 log the natural beauty of the wood may
 even be enhanced.

There seems little doubt that wood,
 probably the oldest of our natural
 materials, will retain its popularity with
 architect, engineer, builder, sculptor and
 decorator and with the general public from
 Lagos lagoon to downtown Manhattan. □



"Elizabeth's sturdy burghers tarred the oak framework of their half-timbered houses to such good effect that many of them are still lived in" Lavenham in Suffolk, UK. (photograph Noel Moffett)

The suitability of tropical hardwoods for structural use in the building industry is unquestioned. For several years now research has been undertaken to encourage structural use of Engineering, Timber Research and Development Association considers the suitability of hardwoods for construction and outlines provisions that have been taken to encourage their use.



Typical of farm buildings using tropical hardwoods

HARDWOODS: Their Structural Uses

THE ADVANTAGES of the denser hardwoods in construction arise largely from their greater strength and stiffness compared with less dense timbers. These qualities enable greater spans to be achieved with a given timber size so that solid timber members can extend to larger areas in competition with steel and concrete. Assisting the same objective, tropical hardwood is available in long lengths and large cross sections free of defects so that large beams consisting of a single piece of solid timber can be used.

For still greater spans, built up beams may be used in which top and bottom 'flanges' of solid timber are joined by vertical plywood sheets secured to the flanges by gluing or dense nailing. With dense hardwoods, single piece flanges may be used up to very considerable spans without changing to two-piece or three-piece flanges. This simplicity of construction again enables bigger spans to be achieved by timber in competition with other materials.

Cost influencer choice of timber

The need to compete in cost influences the choice of timber for structural use. Obviously timbers which command a high price for decorative applications will not be chosen for structures unless lower grades are available at a much lower price. Tropical hardwoods of lower density are often in demand for general utility purposes, so the ones used structurally tend

to be those of medium and high density. Because these are stronger and stiffer than the usual grades of constructional softwoods, they can be used in smaller sections and may then be found cheaper even if their price per cubic metre is somewhat greater than for softwood.

Cost is not the only difficulty to be overcome when introducing structural hardwoods to the building industry. This denser material is naturally harder to saw and nail, and different jointing methods may have to be adopted to produce joints

with adequate strength but more very strong members leads.

Provision of design

The basic information structural designers has been over many years from research in West Africa, and at the Forest Research Laboratory, UK. It involves sawing many small pieces from a number of logs and testing to determine mechanical properties such as strength in compression and bending, as well as physical properties such as shrinkage, durability, ease of seasoning. The results found from this painstaking research is published to provide the starting point for design stresses may be set for each timber by methods in accordance with the natural variation in timber properties.

The design stresses for the African timbers such as Akaba, Mahogany, Afrormosia, Iroko, Opele, Sapele have been covered by the Research and Development Association, the United Africa Company, and the large numbers of timbers available need to make increasing use of 'secondary' species, the main problem with West African timbers is in strengthening any timber whatever its quality for structural purposes. A number of African timbers are quite suitable for structural use and more can be added whenever the need to encourage their exploitation

Nailing tests on various timbers to develop efficient jointing techniques

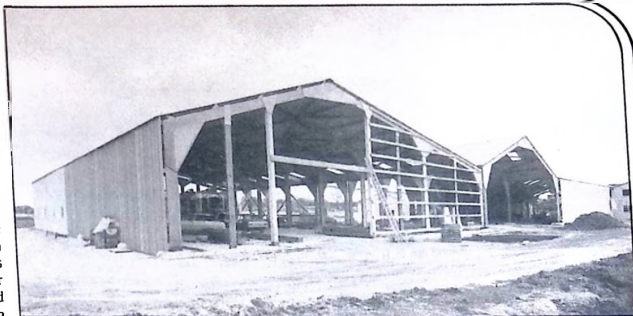


Encouraging the use of structural hardwoods

The development of the structural use of hardwoods at TRADA began with the recognition that designers would be encouraged to use these timbers if it were made easy for them to do so. Design aids are therefore prepared for commonly used structural elements such as joists, beams and wall studs and later for portal frames, enabling designers to pick out the necessary timber sizes very quickly from tables and charts. Special attention was focused on West African timbers under financial sponsorship from the United Africa Company, by preparing data for a Guide to the use of West African hardwoods for structural purposes, the first volume covering the 'H Group' containing timbers as strong as Celtis or stronger.

The full story of the ways to exploit structural hardwoods is a complex one with many intricate technical details. Current examples of the continuing concern with methods for the design of beams and 'stressed skin' panels.

Stressed skin panels, consisting of timber joists with a top 'skin' of thin top and bottom skins of plywood attached by glue or dense nailing, are designed by methods which have changed in recent years following theoretical and laboratory work on softwood panels. Difficult studies are in



Sewmill buildings under construction by United Africa Company using Opape.

progress to up-date the design method for hardwood constructions and good progress has been made in this further attempt to keep hardwood technology abreast of modern developments.

Direct market approaches

The development methods described have been the provision of official documentation as codes and standards, making hardwoods easier to use by structural design aids, and rationalising calculation methods in a way that again encourages hardwood utilisation. Promotion of sales is achieved by including information on the design material in publications for wide

distribution, making the many potential users aware of the existence of hardwoods and of their excellent technical qualities.

With many other impressive structures already constructed in hardwoods and with so many technical advantages, the future of this material in building construction is assured provided a continuing supply of a reasonable constructional grade is available at a cost allowing competition with other materials. Structural hardwoods can then be exploited in proportion to the technical and promotional effort devoted to them, and continuing attempts are being made to gain financial support from producing countries, including those in West Africa, to allow this effort to be redoubled. □

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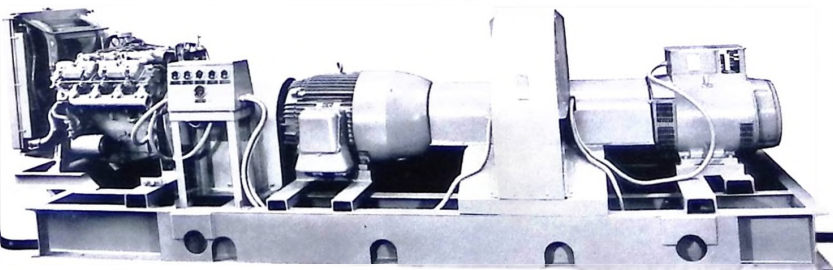
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The range of options with concrete mixers is now so large that one can cater for almost every eventuality within the science of making concrete. A special correspondent reports . . .



Braham Miller's 10NT10/7BC concrete mixer

MECHANISED CONCRETE MIXING

IT WOULD be very difficult to say just when the first mechanical concrete mixer was made and although there is evidence of a horse drawn cider press being converted in the UK during the sixteenth century for mixing plaster for building a house, it wasn't until the beginning of the present century that the development of the internal combustion engine made it possible to make a truly portable concrete mixer. Certainly Wingets made their first machine as long ago as 1908 and since then, the mechanisation of concrete mixing has been an important feature of the development of machinery to cut both the time and cost of producing concrete on site.

A factor which is often overlooked on the smaller jobs, is the consistent quality of machine produced concrete. Hand mixing has the disadvantage of often incomplete mixing, especially towards the end of the day when the mixing crew is suffering from fatigue, whereas, providing that the mix

quantities are accurately measured, even the smallest machine will produce batches of concrete which are consistent with regard to both quality and texture. The hand mixing of concrete must be one of the most arduous tasks a site labour force has to contend with, and with the ever rising cost of hand labour, the mechanisation of even small quantities for new building or repair work, makes both economical and practical sense. Simple wooden boxes for volume gauging the charging of the machine are easily constructed so that even the smallest mixer, a 90/60 litre machine, will produce high quality concrete with the minimum of manual effort, while plaster and mortar can be just as easily made in the same machine.

**WEST AFRICAN
CONSTRUCTION**

The size of a concrete mixer has always been designated by quoting the volume of

concrete it will produce from a given amount of dry materials, in this way the 90/60 litre machine is one which will produce 60 litres of concrete from 90 litres of cement, sand and aggregate when water is added. At the other end of the scale, a 21/14 will make 396.42 litres from 594.64 litres of dry materials each batch. Unfortunately the move towards metrication of weights and measures in the United Kingdom, has produced some rather confusing machine designations, with Wingets, for instance, quoting their machine sizes in both Imperial and Metric as the output of the machine and dropping the dry batch quantities from their machine numbering. In this way a Winget 333/12 R is a mixer which produces an output of 333 litres or 12 cubic feet, whichever measure is more acceptable. In the older designation this machine would be classed as an 18/12 ft³ mixer.

Continued

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LAGOS

ter in the article there is a table which is a range of the concrete mixers available from British makers and compiling a table illustrated the often careless use of many British companies and metrication and trying to make of some catalogues becomes something of a nightmare. The conversion of imperial to Metric has been done with an almost total disregard for accuracy and consistency in almost every catalogue listed, while admittedly the quantities listed are "Nominal" and are often converted to a mean rather than an exact amount, the result is both confusing and irrational. The "great measure middle" pervading British industry at the moment makes it difficult enough to reconcile one source with another when one is working to a standard daily, but in markets where asynchronous modes of expression can only create greater confusion it must be against the interests of sound marketing procedures not to adopt some form of agreed expression of quantities. The total adoption of metric sized machines described in BS 1305 (1967) would remove the problem once and for all. Some makers have odd examples of metric sized machines in their range, their customers are demanding uniformity.

Machine range

The range of portable and transportable concrete mixers extends from the very simple, small machines, mounted on a wheelbarrow frame, to the complex units with a host of special features for the manufacture of extremely large quantities of concrete with weigh batching and power loading of the mixer as standard features.



These machines allow one, or at the most, two men to produce high quality concrete fast enough for all but a continuous pour requirement. Concrete mixers can be conveniently classified by the method in which the concrete is discharged from the mixing drum as:-

1) Manual Tip

Small, simple machines of about 90/60 litres discharged by tipping the whole machine forward in a similar manner to a wheelbarrow.

2) Tiltng Drum Mixers

In these machines, the mixing drum can be rotated through a wide arc by means of a hand wheel so that the concrete will fall out when the drum is pointing downwards. In the smaller sizes, and when power loading equipment isn't fitted, these machines can be loaded and discharged from the same side, which is often very convenient for working in restricted areas. The size range of these machines is usually accepted to be from 141.58/99.11 litres to perhaps 283.16/198.21 litres.

3) Fixed Drum or Non Tilt Mixers

The mixed concrete is discharged from

these machines by lowering a discharge chute onto the drum mouth so that the concrete, falling from the mixing paddles, is caught and allowed to slide down the chute and out of the drum. A more sophisticated version of these machines assists discharge by reversing the direction of drum rotation. These machines are only made in the larger sizes perhaps from 396.42/283.16 litres to 594.64/396.42 litres.

In the column "Approximate Output", the figures quoted are intended to be a guide rather than a factual amount. This is because the output of mixed concrete will

efficiency of the operator, constant availability of materials and sufficient transport to take away and lay the finished concrete, will all influence the mixers output when calculating how much concrete can be made in one working day. Machine capability must always be considered against the background of operating conditions and site requirements.

Small mixers

The very small mixers such as the Parker Handy, Baromix Minor, Belle

A SELECTION OF TILTING DRUM MIXERS

Maker	Model	Nominal Capacity		Approximate Output/Hour		Power Unit	Feed
		Drum	Mixed	Drum	Mixed		
Winget	85/37A	4	113	3	85	38	1.0
	100/37SD	5	145	3 1/2	100	42	1.2
	150/75D	7	200	5	150	60	1.75
	175/87SD	8	240	6	175	72	2.0
Benford	200/77HL	10	300	7	200	135	3.8
	"One Bag"	8 1/2	240	6	175	70	1.8
	10/7	10	300	7	200	135	3.8
	5/3 1/2	5	145	3 1/2	100	42	1.2
Milars	Monomix 10/7	10	300	7	200	150	4.2
	3 1/2 T	5	145	3 1/2	100	42	1.2
	BT	7	200	5	150	80	1.75
	10/7BH	10	300	7	200	150	4.2
Belle Engineering	10/7BL	10	300	7	200	135	3.8
	"Maxi"	4	113	3	85	35	1.0
	"Little Giant" 100	5	145	3 1/2	100	42	1.2
	150	5	145	3 1/2	100	42	1.2
Parker	150	7	200	5	150	60	1.75
	160	7	200	5	150	60	1.75
	"Min Giant" 3T	4	113	3	85	35	1.1
	Speedex 3E0LN	12	350	9	250	187	5.3
James & Low	77H/A	10	300	7	200	150	4.2
	77H/B	10	300	7	200	150	4.2
	Rob Roy 4/3	4	113	3	85	30	1.0
	5/3 1/2	5	145	3 1/2	100	42	1.2
Benford	10/7	10	300	7	200	150	4.2
	4/3	4	113	3	85	35	1.1
	5/3 1/2	5	140	3 1/2	100	42	1.2
	8/8	8	225	6	170	88	1.9
Baromix	"Commodore" HF	10	300	7	200	135	3.8
	10/7	10	300	7	200	135	3.8
	7/5	7	200	5	150	60	1.75
	5/3 1/2	5	140	3 1/2	100	42	1.2
Limer	4/3	4	113	3	85	40	1.1
	"Cadet" 3T	4	113	3	85	40	1.1
	"Ensign" 3 1/2 T	5	140	3 1/2	100	42	1.2
	"Junior" 3 1/2 T	5	140	3 1/2	100	42	1.2
Belle Engineering	"Major" 6T	8 1/2	240	6	170	70	1.9
	"Commander"	10	300	7	200	150	4.2
	"Fluittit"	10	300	7	200	150	4.2

SMALL FIXED DRUM, HAND TIPPED MIXERS

Parker	Handy 75	3.5	100	2.8	75	28.26	0.75	Patrol or Elec.	Hand
Boulton Fabrications	"Easimix"	3	90	2.0	60	22.50	0.65	..	..
Baromix	"Minor"	3	90	2.0	60	22.50	0.65	..	..
Belle Engineering	"Minimix"	4	113	3.0	85	30.00	0.85	..	..

FIXED DRUM (Non-tilting) AND REVERSING DRUM MIXERS

Parker	10 NT	14	397	10	284	218	8.2	Diesel	Power Skip
	8.5 NT	18.5	525	12.3	350	225	8.4	..	..
Milars	Hv Mix 400 R	21	800	14	400	325	8.5	..	..
	10 NT	14	397	10	284	218	8.2	..	..
Benford	2 1/4	21	800	14	398	320	9.1	..	..
	18/12	18	510	12	350	298	8.4	..	..
	14/10	14	400	10	300	218	8.2	..	..
	300/10 R	14	400	10	300	218	8.2	..	..
Winget	333/12 R	18	510	12	350	270	7.7	..	..
	400/14 R	21	800	14	398	325	9.2	..	..
Limer	10 NT	14	400	10	300	218	8.2	..	..
	2114 RD	21	800	14	398	325	9.2	..	..

vary considerably due to the different materials which can be used in the mix. The size of aggregate will have an important bearing on both the mixing and the loading time, and to illustrate the point, the difference between the output using shingle as the aggregate can be greater by as much as 10% to the output when broken stone is used. Quite obviously there are other factors to be taken into account too; the

Minimix and the Boulton Easimix have rapidly become an almost indispensable item of plant for the jobbing builder and a necessary standby for the larger contractor. Capable of producing good quality concrete in easily handled amounts, they have taken the hard work out of keeping the smaller job supplied with consistent quality concrete and one of their major

Continued

Parker Plant ...best in the field



Parker plant means dependable performance day-after-day on a variety of construction jobs. Parker plant includes mobile crushing plants, primary rock crushers with hourly outputs up to 450 tonnes, secondary screening and crushing with hourly outputs up to 300 tonnes and screening units. Working singly (top illustration) or teamed together into complete crushing and screening plants (centre illustration). Parker plant also includes mobile asphalt plants. Traditional plants with hourly outputs up to 160 tonnes (bottom illustration) and continuous drum mixing plants with hourly outputs up to 400 tonnes.

Many years of supplying plant to West Africa has given Parker an unrivalled experience, with a strong network of local distributors backed by specialist Parker sales engineers to give detailed attention to customers requirements including after-sales and parts service.

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& Trading Co. Ltd., P.O. Box 3400, Accra.

LIBERIA. Frelex (International) Ltd.,
P.O. Box 38, Monrovia.

NIGERIA. Afrotec Technical Services
Nigeria Ltd., P.M.B. 1061, Oshodi,
Lagos State.

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GREAT BRITAIN Ph 0533 65888 (20 lines) Telex 34542
London Office: C P HOUSE, 31-101 UBBERIDGE RD, W5 6TP Ph 0187 034342

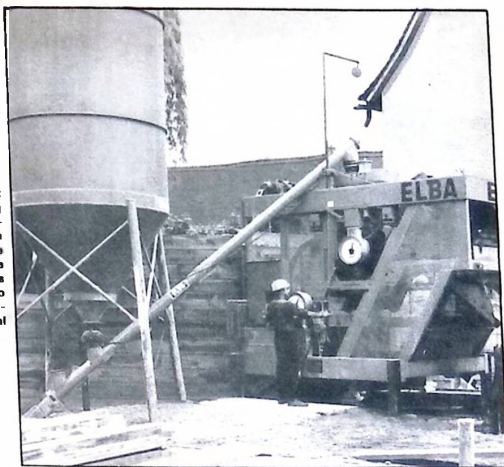
stages is the ease with which they can be transported from site to site. They are strong enough and light enough (The Elba Easimix only weighs 69.85 tonnes) to be lifted into the back of a truck, or if the drum is unscrewed, can be carried in the boot of a car. The small mixers find work in many ways and are used by farmers and horticulturalists for mixing fertiliser, animal and human foodstuffs. Potting mixes and special soil compounds are other examples of the range of duties to which these very handy little machines can be put with a saving in time, effort and cost.

Largest range — tilting drum machines

The largest range of concrete mixers falls within the category of Tilting Drum machines and they vary from the quite simple, small machines of 1.2 capacity which are the basic mixers of the householder, to the massive 12/5 and 10/7s which can be fitted with additional refinements for batch mixing on a large scale. In the larger sizes all makers offer optional power skip loading of the sand and aggregate into the mixing drum either, by conventional winch and wire rope mechanisms or by a hydraulic ram.

Additional equipment can be supplied which uses a load cell to weigh the quantity of material being loaded into the skip and a readout on a large dial with preset pointers, assures constant weighbatching. Water measuring devices vary in type from maker to maker, but all are capable of being adjusted so that a measured quantity of water is admitted automatically into the mixing drum at the same time as the dry materials are being introduced. Shaker cams on the drum, or on a separate shaker shaft, vibrate the loading skip so that it is

Elba's EMM fully mobile compact concrete batching plant with all main components on a common base frame. The concrete discharge supports or foundations to satisfy the requirements for practical application.



completely emptied each time the drum is loaded. To assist in filling the loading skip, dragline type scraper shovels can be fitted which are operated by a winch and a long wire rope driven from the main engine through a clutch or by a solenoid operated hydraulic motor. This feature means that materials can be tipped close to the mixer and subsequently loaded by one man into the loading skip without further re-handling.

Hydraulic power transfer systems — biggest advance

Perhaps the biggest advance in recent years in the development of concrete mixers, is the introduction of hydraulic power transfer systems. These reduce the

number of exposed working parts to an absolute minimum and although the hydraulic components themselves are susceptible to damage from the dusty atmosphere usually associated with making concrete, suitable filtration, providing it is correctly maintained, will eliminate the problem and give a reliability factor much higher than could be expected from a purely mechanical drive. There are other advantages to be had from using a hydraulic system, especially for operating the loading skip, where a simple hydraulic ram replaces a complex system of ropes and pulleys and provides what amounts to an automatic braking system without the use of drums and bands. Liners fit a slow speed hydraulic motor directly into the hub of the mixing drum where it is protected from damage and drives the drum without resorting to additional intermediate gearing and of course it completely eliminates the circular rack and pinion of the conventional mixers and the wear problems usually associated with these components. Hydraulic winches for both scraper shovel loaders and material hoists are a feature of many of the latest machines and not only are these mechanisms very positive, they can be remotely controlled by solenoid valves with switching mechanisms connected by a long trailing cable. This makes the working of the scraper shovel a very simple task with an expectancy of greatly reduced maintenance and operating cost.

WEST AFRICAN CONSTRUCTION

Since the speed of operation of hydraulic drives is dependent on the quantity of oil flowing through the system, hydraulically driven machines are capable of a wide variation of speed without affecting the power available to drive the mechanism. This can be of tremendous advantage when a wide range of mixes is encountered on one site, including the making of mortar

Continued



Winget's large-scale tilting mixer with mixed batch capacities up to 4.5m³

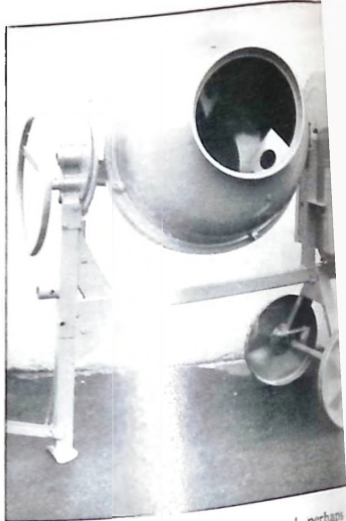
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and plaster. The fitting of winches is especially useful for delivering concrete to high buildings. Used in conjunction with a pulley system mounted on the scaffolding or the building itself, these hoists are capable of lifting a bucket holding one mixer load and eliminate the need for a separate hoist. Control is either a conventional mechanical clutch with the operating lever weighted to return automatically to the 'brake on' position when it is released, or increasingly, a hydraulic motor taking its power from the main pump driven by the engine.

Non-tilting and reversing drum mixers

These mixers are the heavyweights of the range and operate on a different system to the mixers discussed previously. These machines work on the "tunnel" system of mixing, where the dry materials are loaded in at one end of the drum and the mixed concrete is discharged at the other. Designed for very heavy loads, the drum is carried on rollers which support it throughout its length thereby removing the cantilevered loads associated with the tilting drum machines and making it possible to build mixers with a greater load carrying capacity. Makers are a little diffident about quoting the output per hour of this type of machine because of the wide range of variables which can affect their performance, but it would be safe to

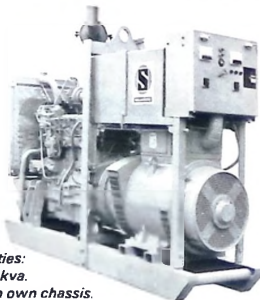
Leach's heavy duty mixer, the C9, powered by an air-cooled Hatz diesel engine which features considerable power reserves.



assume that even under adverse conditions, the best of these machines will make 9.2 m³/hr. when fitted with power scraper, shovel loaders and full weighbatching equipment and that is a lot of concrete. The standard non-tilting machine discharges the mixed concrete by a chute which is introduced into the discharge side of the drum by a handwheel. The more

sophisticated and perhaps reversing drum machine discharge side of the drum rubber extension cone which mix into the transport vehicle drum rotation is reversed. These mixers have two sets of blades inside the drum, one set mixes

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drum is revolving and directs its fall into the drum. The other set of blades is angled in such a way that when the mixer is reversed, the concrete is directed into the discharge opening. The Parker 11X 400R and the Liner 21/14 RD are very good examples of this latest trend in mixer design which uses hydraulics to operate the loading skip, with the Parker 11X 400R utilising hydraulics for the drum as well.

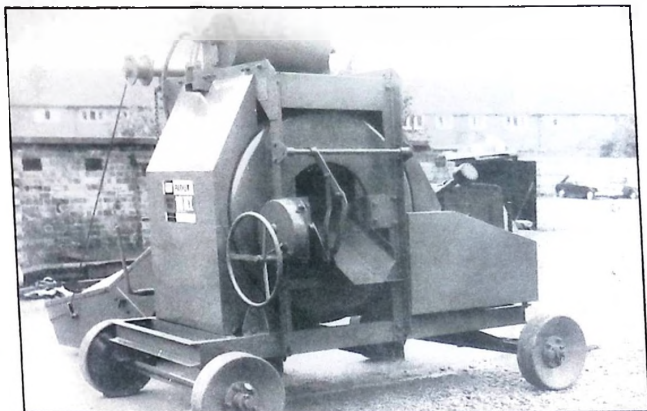
Mounting

There are almost as many variations of mounting as there are individual mixers. Each alternative is designed to cater for a specific application. The choice of mounting will depend on the amount of travelling the machine will have to do, whether it is on site, or from job to job. Simple, sturdy steel wheels will be adequate for most site work and being less susceptible to accidental damage, offer the minimum maintenance and repair costs. Cast or course steel wheels are not suitable when the mixer has to be moved frequently and over a great distance. The alternative is to fit solid rubber cushion tyres which allow the machine to be towed at a greater speed.



Benford "one-bag" 5 1/2/6ft³ capacity concrete, mortar and plaster mixer

However, even these tyres are not suitable for high speed towing when pneumatic tyres should be used with the wheel hubs fitted with roller bearings and possibly overrun brakes. Except for the very small



Frederick Parker's 10NT concrete mixer, widely used throughout West Africa. The mixer, which has a mixed batch capacity of 281 litres and gives approximately 90-115m³ per 8 hour shift

mixers which can be man-handled into a truck or even stowed in the boot of a car, almost without exception mixer makers have a very wide range of options to their mountings to cater for different site requirements. In the range of machines with capacities from 120/190 to 141.58/99.11 litres or even as large as 198.21/141.58 in some instances, two or four wheel options are universal, with the two wheel version having a steady leg built into the main frame to support the mixer when it is working. The Winget 100/3 1/2 TSD and the Baromix Commodore Fast Tow 4/3/ are good examples of this type of machine. The designation of the mounting can be broken down into four categories for easy identification:



- 1) **PORTABLE** (Walking pace)
Steel wheels on simple, plain bearings
- 2) **Slow Tow** (16 kilometres per hour)
Solid cushion tyres on plain bearing wheels

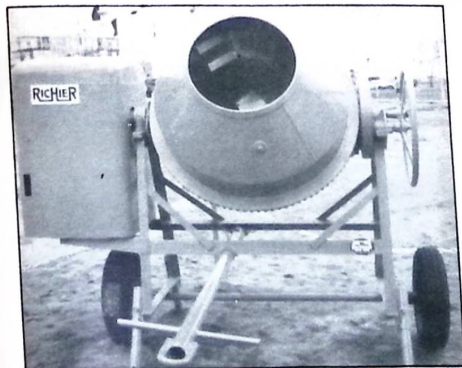
3) **Fast Tow** (24-32 kilometres per hour)
Pneumatic tyres on roller bearing wheel hubs

4) **High Speed Tow** (Up to the legal maximum)
Pneumatic tyres on roller bearing wheel hubs on fully sprung axles and fitted with overrun brakes, mudguards and full trailer lighting equipment.

Considerable choice

There is certainly sufficient choice to match the machine to almost every requirement, from continuous use on one site, to the ability to rapidly travel from place to place for jobbing work.

From an easy of providing a solid base on which to build a structure or a simple compound for filling gaps between other building material, which is all concrete was considered to be only a few years ago, modern concrete has become a highly sophisticated building material in its own right. There are varying specifications which must be rigidly adhered to if the full potential of the material is to be realised and today's breed of concrete mixer has been developed so that mix specifications can be accurately and, more importantly, consistently produced. Mixing drum design and blade configurations have been improved to reduce mixing time and thereby reduce production costs while ensuring a homogenous compound of the highest quality. The introduction of hydraulic drives has led to machines with cleaner lines and far less mechanisms to wear out or go wrong. At the other end of the size range, the small wheelbarrow type of mixer has mechanised the mixing and provided quality control for even the smallest of jobs. With a thorough knowledge of worldwide site requirements, makers have included a range of options with their machines to cater for almost every eventuality within the science of making concrete. □



Tilting drum mixer from Richier — a very popular machine in Nigeria available through Agricon



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EXPOMAT — A REVIEW

John Deere 750 crawler bulldozer

JD750 is a bulldozer with a 100 hp. engine. The transmission is entirely automatic thus requiring no shifting, increasing speed having to increase or decrease the speed manually. The JD750 is very mobile. Its tracks are infinitely variable, moving forwards and backwards, from 0 to 10.5 km./h.



It is also compact (5.01 metres long) and its counter-rotation tracks allow it to work in narrow or congested sites.

The unique thin plate control lever, with hydraulic adjustment of vertical inclination and floating. For more information, contact R. T. Briscoe.

New jaw crusher

Among the range of new jaw crushers Bergeaud had on show was the VB 1109 jaw crusher (1130 x 900 mm. feed opening) and the VB 1008 (1000 x 800 mm. feed opening).

Both machines present those new technical advantages designed into the VB 1311 which had been very well accepted. These include:

Square feed opening and a welded frame;

Nothing extending below the crusher discharge level such as the pitman, which means easy



Under an international agreement the various countries in Europe decided to rotate their construction equipment fairs. The idea behind this is that when fairs do occur, they should have more impact, and attract more visitors.

The 11th EXPOMAT held in Paris had over 650 stands showing the products of virtually all the world's major suppliers of plant. Unfortunately the numbers of visiting participants from outside France did not match up to this very impressive display. Many exhibitors who had been hoping that EXPOMAT would help fill their dwindling order books were disappointed, although there were others who were very pleased with the results.

In the next issue we will be featuring a review of the compaction equipment at the show specially written by John Latham, Managing Director of J. N. Plant Engineering Consultants Ltd. Below we are reviewing a selection of some of the other equipment.

transportation, erection and maintenance of the machine;

Extended jaw plates to avoid wear of pitman and frame; and

Hydraulic assistance for jaw removal, setting adjustment and toggle removal.

The VB 1109 (150 to 450 TPH capacity) was exhibited on a portable chassis with the ATV 1050 vibrating scalping feeder which is also a new Bergeaud product.

This feeder includes a troughing plate moved by a double counterweight mechanism, supported by a set of springs and preceded by a heavy duty feed hopper.

This range of feeder can be adapted to any kind of feeding problem.



The Loro & Parisini stand, showing their crushing unit

The MF500C crawler loader

Massey-Ferguson are launching at this year's Expomat the new

The "Puncher" bulldozer exhibited by Case



The Sambron stand

1.35 cu. m. 113 hp. MF500C crawler loader; the MF500C is engineered and styled in line with the very high standards created by the now well established MF400C which was launched at the last Bauma in Munich.

The engine is the Perkins six cylinder turbo-charged T6.354.4 and is matched to an MF built torque converter power shift transmission having three forward and three reverse ranges. The advantage of the turbo-charged engine is that it is a well proven unit with plenty of power for the hardest conditions and also operates up to 1500 m. altitude without deration. The transmission range change is independent of engine speed and the precise 'soft' shift at full power gives the best operator comfort and fast cycles.

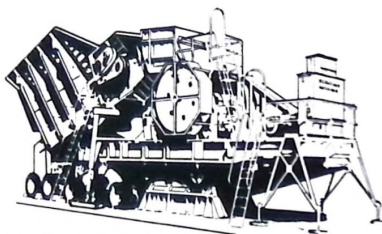
The transmission, torque converter, rear housing and hydraulics all use the same oil common loader hoses and a single test console for the hydraulic services help to reduce downtime by speeding up fault analysis and part replacement.

More information may be obtained on any item by using the form facing page 160

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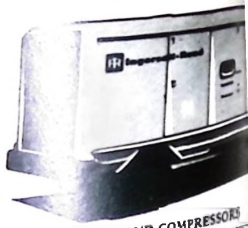
BERGEAUD REXNORD CRUSHING AND SCREENING PLANT
Fixed and mobile plant, with capacities from 12 tonnes to 500 tonnes. Single and double toggle jaw crushers, cone crushers, gyradisc crushers, impact crushers, bar mills and hammer mills. Push and apron feeders. Conveyor belts. Prices from N40,000.



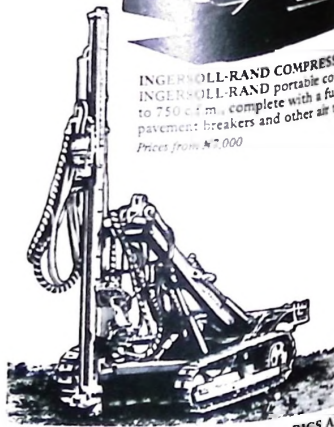
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EXPOMAT — A REVIEW



Just two of Poclain's large range of hydraulic excavators

World premiere for telescopic crane

Demag's HC65 telescopic crane had its world premiere. It represents the modern type of the speedy, versatile "one-man" truck crane. The boom extends under load to 24.3 metres and reaches 35.7 metres high with lattice extension. It lifts 25 tons



over ends and sides. Also on show for the first time was the self-propelled version of this hydraulic crane, called the MHC 65. For more information, contact Henry Stephens in Ilupeju.

Hydra-Trac drill carrier

The new hydraulic track mounted drill carrier and portable power-pack, the HT3100 Hydra-Trac and PHP1 Hydra-Pac, were presented for the first time. This new combination applies the proven Gardner-Denver hydraulic drilling technology of underground applications to the needs of surface drilling for quarry and construction operations — anywhere holes up to four inches in diameter are drilled in hard rock.



The HT3100 Hydra-Trac drill carrier is designed to tow the PHP1 Hydra-Pac which combines the hydraulic power unit with a screw compressor for blowing air. The two units are connected by means of an umbilical connection up to 100 feet in length which includes low and high pressure hydraulic lines and a blowing air hose. The hydraulic energy efficiency provides more drilling at less operational cost for the same capital investment as conventional pneumatic drilling. In addition to the energy increased efficiency this hydraulic drilling system is more reliable, cleaner and quieter than comparable hydraulic and pneumatic systems.



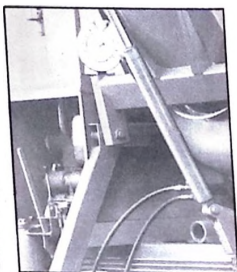
The Park Plant display



Dynapac's CK4 roller

Automatic weighing device

Using the new Lescha automatic weigher, up to 1,200 kg. of aggregate can be weighed. Weighing takes place in the loader. The hydraulic pressure on a hydraulic cylinder in the loader suspension is transferred to the weighing head



and indicated. The required amounts of 2 types of material can be set on the indicator scale by means of riders. The weight is accurate to $\pm 2\%$ of the scale value. This ensures that the quality of the concrete remains

constant. For more information contact M & E (Division of UAC) in Ebute Metta.

Prestressed concrete bridge girder process

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Technological equipment includes a production line with steel form and subterranean prestressing bench, a bench for preassembling the reinforcing cage; a balance beam for placing the reinforced cage of the full fabricating line into the form; concrete pouring car; lifting equipment, and stressing equipment. For more information contact BVM in Budapest.



Henry Syke's Pumps stand

Nabco's new 777 B grader, distributed by Bewac in Lagos



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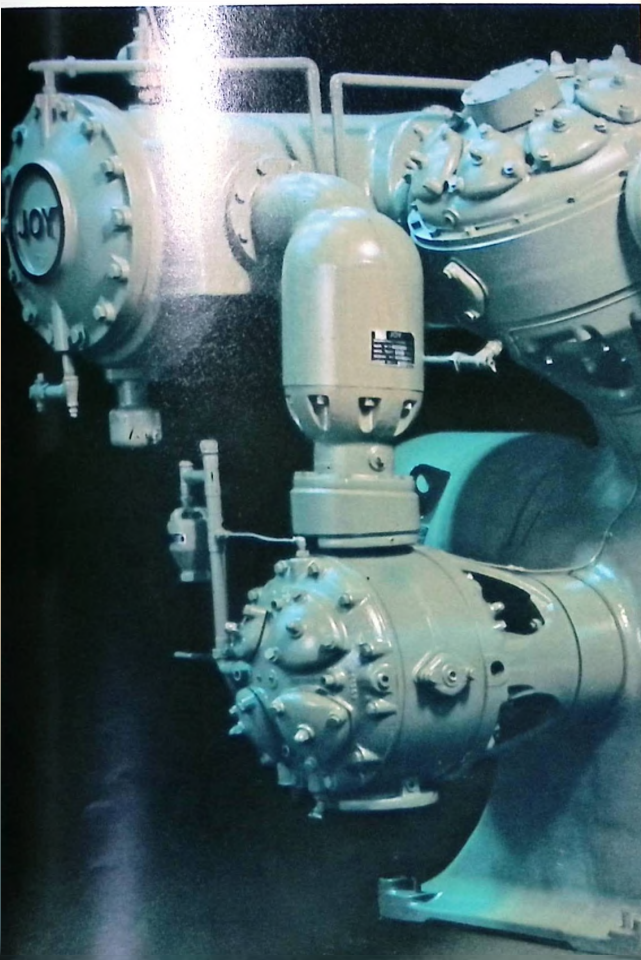
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West African TECHNICAL REVIEW

The International Magazine for Industrial & Business Management

January 1978

EXPOMAT — A REVIEW

162 scraper

JD762 is a 190 hp. automatic loading scraper with axles. When fully loaded (5 tonnes) it can reach a speed of 44 km./h. It has five speed power shift transmission and its manual torque converter shows light consumption of motor when running.



Self-contained generating sets

The Nova range of self-contained generating sets has been designed and manufactured by Lister Power Plant in response to customer requirements for a totally integrated electrical power centre.

The Nova generating sets are mounted on heavy duty skid type base plates to ensure easy handling on site.



Climbing tower crane

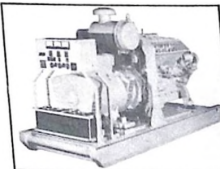
The Liebherr 120 HC climbing tower crane with trolley jib is a totally new design.

The 120 HC is available in 3 basic versions: the 120 HC, the 120 HC/13 and the 120 HC/18. In addition, Liebherr's modular-unit design concept supplies you with any number of additional versions for special purposes.

The new crane has two or three separate switchgear cabinets, depending on whether it is for stationary or railborne operation. One is located in the all-glazed cab, another on the hoisting gear assembly and a third on the undercarriage of railborne cranes. This decentralized design enables almost all items to be ready-wired for use.

Steel tank semi trailer

This trailer from Traylor is for heavy petroleum products. It is of single compartment with a nominal capacity of 27,500 litres.



Each set is powered by a Lister direct injection four stroke, cold starting diesel engine which is close coupled to a rotating field brushless alternator. The engine and alternator unit is secured through anti-vibration mountings onto the base plate and thus no further isolation mountings are required when the set is installed.

A fuel tank with capacity to allow approximately 12 hours running at full load is fitted into the base. The starting batteries are also assembled onto the base-plate within the overall dimensions of the set. Part of the Nova range includes a group of sets constructed for operation under conditions where instrumentation and set protection is not of paramount importance. On these sets only the basic instrumentation is included. For more information contact R. T. Briscoe in Lagos.



The 120 HC can be supplied with 6 different lengths of jib: from 25 m. to 50 m. radius. At 50 m. radius, the crane can lift 2,000 kg.; its maximum load limit is in the region of 8,000 kg. Trolley speeds of up to 73 m./min. and hoisting speeds up to 61.0 m./min. are available.

The crane uses a single-fall (two-run) rope layout at all times. The hoisting gear is mounted as a complete assembly on the counter-jib and uses a 3x pole-changing motor and electromagnet-shift 2 speed gearbox (standard version). The various ratios can be selected under load, from the control panel.



Thanks to a hydrostatic drive and reversible hoist with variable speeds, the speed can adapt itself automatically to the loading of different materials.

The very short turning circle — 9.14 metres — permits the use of this material on narrow or congested sites.

Mobile compact mixing plant with turbo mixer

This plant, manufactured by Stetter, has been developed as a compact and efficient mixing plant which is employed on large building sites requiring large quantities of concrete per hour as well as in precasting and concrete block factories. The capacity is 750 litres of loose aggregate, the ready-mixed concrete output being 500 litres per mixing cycle. With 52 mixing cycles per hour a compact-concrete output of 26m³ can be obtained.

Outstanding features of the mixing plant are compact construction and mobility. Erection on the site and change of plant location is no problem at all. With the exception of the operator's platform and the radial scraper, the plant can be transported on the single-axis chassis with over-run braking gear trailing behind a truck (25 Km./hr) without any need of dismantling further units. The mixer unit with cement scale is lowered towards the front for transport.

For filling the tank there is one special manhole for heavy petroleum products — quick opening and closing — fitted with capacity markets and stops for calibration dipsticks. Discharge is by gravity: one valve is fitted at the rear of the tank with symmetric couplings and caps. There is also a spill trough.

There are two Traylor tubular N400 type axles of 146 mm. diameter with forged spindles.

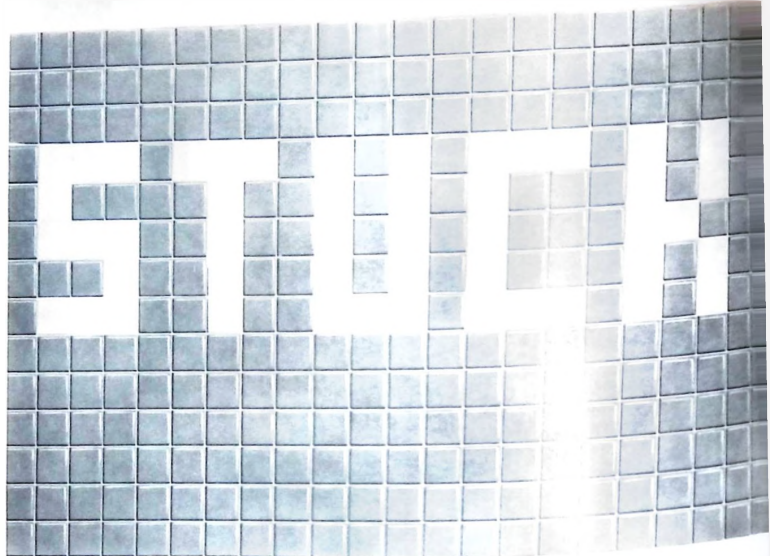


Carlo Pasci's hydraulic crane



Clark's Bobcat loader

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Gabon. Société Gabonaise des Pétroles Shell (SGPS) Boîte Postale No. 224, Libreville.

Ghana. Shell Ghana Limited, P.O. Box 1097, Accra.

Ivory Coast. Shell Côte d'Ivoire, B.P. 20847, Abidjan.

Liberia. Petro Chemical Industries Inc. P.O. Box 464, Monrovia.

Nigeria. National Oil & Chemical Marketing Co. Ltd., Private Mail Bag 2052, Lagos.

Senegal. Iransen et Shell, P.O. Box 144, Dakar.

Sierra Leone. Shell Sierra Leone Ltd., P.O. Box 66, Freetown.

Shell Composites Limited 

EXPOMAT — A REVIEW



Central view of the Coles stack handling (centre) Coles Hydramobile 911 and (centre left) Coles Hydratruck 12/14T 4 x 4



The special feature of this machine is that cutting is effected by a drum which cuts downwards and which is driven by the scraper chain of the cutting boom conveyor. The material produced is received by this conveyor and loaded into the rear conveyor for discharging onto subsequent disposal systems.

Should hydraulic motor maintenance be required the complete unit is easily removed from the machine without disturbing the mixing drum.

F65C scraper from Faun-Frisch

This new scraper has an articulated chassis, an extremely small turning circle and flexible hydrostatic control. It is particularly manoeuvrable with perfect visibility.



Reversing drum concrete mixer

Just on the market is a new reversing drum concrete mixer, from **Frederick Parker** designed to meet the needs of the big builder in producing a wide range of high-quality concrete at a fast rate. Known as the "Hy-Mix" 40UR, it is mechanically fed and has a batch capacity of 600 litres unmix and 400 litres mixed. It will produce at a rate of $\frac{1}{2}$ cu. m. per batch, and achieve an hourly output of 9 cu. m. with ease.

An air-cooled 13.8 hp. diesel engine, equipped with tandem hydraulic pumps, operate the hopper and drum and, with no clutches or mechanical gear units to bother about, maintenance is kept to a minimum.

The cabin is spacious and comfortable with panoramic viewing.

The air-cooled injection diesel engine is Deutz and has three cylinders.

The precise hydraulic controls are rapid and sure including the lateral alignment of the blade.

Carrier mounted hydraulic crane

This new crane from **Clark Construction Machinery Group** has a maximum lifting capacity of 25 tonnes, with full duties through 360°. It has a standard four-point hydraulic outrigger configuration, a 32 metre, light-weight boom which is fully-telescopic and with full synchronisation of all three moving sections.



The crane superstructure is mounted on the highly-maneuvrable Clark Cosmos 6 x 4 heavy duty crane carrier.

The carrier also provides a unique standard of driver comfort and exceptional all-round vision. For more information, contact **Holt Engineering** in Apapa.

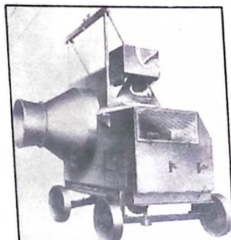
successful and proven features of Matbro's cushioned tyred electric trucks including full power steering, 72 volt thyristor control system and excellent visibility through the mast.



The Pinguely stand with their TT286 in the foreground

Boom Cutter loader dachs

The Boom Cutter Loader Dachs from **Westfalia Lünen** is the medium-duty machine for minuter cutting and loading. It is particularly suitable for conditions where a flexible and manoeuvrable machine is required. Although compact in design and light in weight, the Dachs is capable of driving a roadway 4.3 m. wide. Its cutting boom can be raised to cut a height of 4.25 m. above the tracks and lowered to cut a depth of 1 m. below the tracks.



A single lever controls the mixing and discharge rotations, and all controls are grouped together in a convenient position to give the operator a clear view of the loading and discharging operations.

Pneumatic tyred battery electric fork lifts

In response to customer demand **Matbro Limited** have introduced a new range of pneumatic tyred battery electric forklifts which are suitable for both inside and yard use.

The new range comprises four models, the EP30, EP40, EP50 and EP60, with capacities 1,361, 1,814, 2,268 and 2,722 kg. at 610 mm.



Whilst trucks in the EP series are as compact and manoeuvrable as comparable solid tyred electric trucks, the 7.00 x 12 front and 18 x 7 rear pneumatic tyres, which are fitted as standard throughout the range, offer increased traction in the wet and on inclines as well as reducing the transmission of road shocks to the load, driver and the trucks' mechanical components. In addition, the EP series offers a better performance and higher ground clearance than Matbro's existing range of electric trucks.

However, the new trucks do incorporate many of the

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EXPOMAT — A REVIEW

te top

is a new multi-purpose machine specially designed by to meet the requirements of the individual house construction. Its characteristics and ability allow to combine the and transport on the ground and their positioning on the sliding under construction.

Its traveling speed, cross-country capacities, little space requirement and manoeuvrability allow it to rapidly travel under load from the store yard to the building to be constructed, to move around the building and to supply the working place at the required spot and as far as possible inside the building.



Various equipment make this truck/crane assembly a machine capable to carry out a great variety of works on the site: earth removal (with a loader), earth transport, even small earth work (using a backhoe or a bucket).

Its hoist characteristics are: 4.5 T at 3,30 m. radius; 1T at 10 m. radius; and 3 T at 5 m. radius and 11 m. height. It can be equipped with 2 fly jibs which considerably increase the radius.

Its remarkable qualities as cross-country machine are due to its 4 powered wheels equipped with specially adapted pneumatic tyres, the differential lock, its great ground clearance (the lowest point is at 550 mm. from the ground), and to its power-shift gear it is equipped with, giving at any time a wheel torque adapted to the terrain.

Adjustable-bed semi-trailer

This variable-length semi-trailer is intended for transporting long structured elements, such as

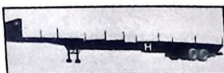


beams, concrete reinforcing rods, roof trusses, pillars, and so forth. It is formed of two chassis elements, one sliding and the other, providing an extension adjustable in 1-metre steps up to 6 metres.

The sliding chassis is locked in each position by two pneumatically-actuated latching pins. Two sliding cross-members provide load support in the extended section. Compressed air and electrical connections are automatically moved to follow chassis extension.

New tipping trailer

The variety of materials transported by tipping trailers (sand, beet, rocks, cereals, iron, etc.) forces the transporter to find a particular solution for a particular type of transport and a polyvalent-solution for various transports.



Trailer have found the solution with their new range of tipping trailer — Modular.



The Palfinger range of cranes

Scania D8 marine diesel

The Scania D8 has a cylinder block of alloy cast-iron, with replaceable wet-type cylinder liners of centrifugally cast special cast-iron. There are three cylinder heads, each covering two cylinders. The valve is made of heat-resistant steel and the camshaft is drop-forged of alloy steel, hardened, ground and polished.

EKCO weighing system

The Ekco 'FLT' weighing system is suitable for installation on all types of fork lift trucks.



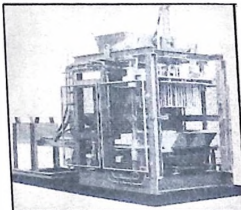
It features simple controls and easy-to-read display of information either in bright digital form or by meter. The meter version has a 'quick reading' facility in the form of a rotatable cursor; when handling standard loads the cursor is set to the required figure and then any deviation above or below the line is clearly seen.

Installation is relatively simple; there is only minimum adjustment to lift chains, and lift height is not restricted. The computer unit can be located in any convenient position and the display unit in a position which gives maximum visibility to the driver.



Ingersoll Rand's Crawler drill

Schlosser has manufactured a high-duty blockmaking machine for the manufacture of hollow, lining, ceiling and chimney blocks, curbs and similar concrete units.



It has strong vibration forces, a rapid interchange of mould equipment and headload, a feeder box and hopper adjustable to mould box height by means of a cranked handle.

There is a robust torsion-free welded double frame, precision column guide for pressure plate and mould box guide bearings with exchangeable bushes and hydraulic operated pressure plate locking during demoulding. For more information, contact Wehrhahn in Ikeja.



The O & K stand with their PH40 crawler excavator in the foreground

Breakthrough design in breakers

Fitted with two hydraulic breakers, the Hyscot 702, with its quiet running, is the ideal machine for operating very close to residential buildings, with two hydraulic breakers it gives double output for quick operation and therefore less traffic obstructions.



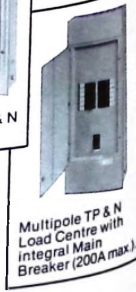
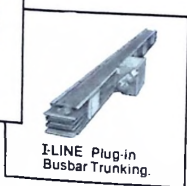
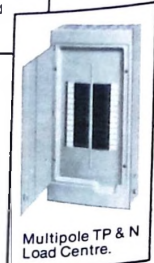
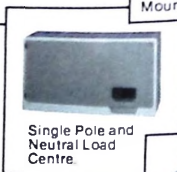
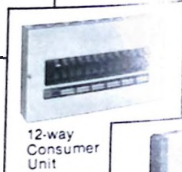
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Local labour being employed to lay TAC's pipes for a drainage scheme

ASBESTOS CEMENT

Improving housing and water supplies forms a top priority on any development programme, hence the need for readily available and durable building materials. This article by P. Turner, Technical Manager of TAC Construction Materials Ltd, looks at asbestos cement, its applications and growth in production.

WHEN DID you last try to hold a conversation under an unlined tin roof in a tropical downpour? or lie on a bed perspiring with malaria with only the same hot roof between you and the burning sun? Grass roofs are cheaper, cooler and quieter but their short life and susceptibility to leaks, infestation and fire made West Africans aware of the advantages of non-corrodible, solid asbestos-cement sheeting.

Growth in imports

Imports of flat and corrugate sheets from TAC Construction Materials Ltd, from UK built up considerably in the 1950s until the early 1960s when, with many countries gaining independence, and in recognition of the high transport costs incurred by heavy, bulky products, TAC's parent company Turner & Newall Ltd, decided to start two joint ventures in Nigeria with State Government participation to manufacture asbestos-cement

sheets and pressure pipes in Enugu and a little later ac sheets in Kaduna. The total capital cost of both projects, in those far-off cheaper days, was just over £2m.

These factories were provided with good new machinery and employee amenities, and were vastly superior to the sheds housing second-hand equipment which posed as "production units" at the time. To design, buy, ship, construct and commission such factories required a combination of technical skills and planning ability which was readily available with TAC's forty years of ac experience, locally available building expertise and the considerable assistance of local Government officials. Anyone who knows the problems of building in West Africa and has seen the complexity of asbestos-cement manufacture, would have been as pleasantly surprised as were officials invited to the opening ceremony of the Enugu factory in 1963, to see an ac sheet come from the machine when it was planned.

The same expertise, coupled with

up-to-date information on product formulation, material utilisation, quality control, engineering developments etc., is continuing to be made available by TAC to the two existing Nigerian companies.



Members of TAC building and insulation division with General Shuwa, Commission for Trade at the recent International Trade Fair in Lagos.

Additionally the same expertise is offered to any company wishing to build

continued



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ad
as-cement factories in West Africa

1974 both the Nigerian companies, Building Products (Emene) Ltd. and Turners Building Products (Kaduna) Ltd. in Kaduna, had orders for products far exceeding their output. Plans to improve output initially by increasing productivity and later by investing in more plant and equipment were started. These two companies now produce some 40,000 tons of sheeting products and 13,000 tons of pipes a year. Plans to increase output of sheeting by 100 per cent and pipes by 50 per cent, and to improve other facilities are under way. All costing about £10m.



TAC pipes awaiting shipment to Lagos.

Increased orders

Oil money was being funneled through Government agencies into orders for roofing for schools, hospitals and clinics, military barracks and medium cost housing schemes, as well as factories. Water supply schemes needed more and more air pressure pipes. Profits made by individuals were further invested in private houses, again increasing the demand for good quality asbestos-cement sheets. The shortages drove prices up and made it commercially necessary and economically viable to satisfy some of the extra demand by importing sheets and pressure pipes from the UK. In fact, in 1975 and 1976 TAC

shipped large quantities of sheeting and pipes to West Africa (mostly to Nigeria), which was largely the reason they received the Queen's Award for Export Achievement in 1977. Exports in that year were further substantially increased and prospects are good for 1978.

Improving housing standards









By importing sheeting and pressure pipes, we are assisting in overcoming two of West Africa's biggest problems, low housing standards and inadequate water supplies. Both are closely connected with health. These problems will not be solved

quickly and require that greater attention be paid to the fundamental aspects of physical and environmental planning. When water supplies become adequate, sewage and drainage will then be a problem unless systems are planned in detail now. How many West African cities have central sewerage systems? How many homes are linked to proper septic tanks rather than just a hole in the ground? Health problems in the tropics are great enough on their own without being aggravated by further fouling of ground-water supplies by the sewage of a rapidly expanding population.

The same increase in numbers puts an intolerable burden on the often neglected ability of the town planners. Many more of them are needed if the accommodation now being built to house the exodus from the rural areas to the towns is not to be regretted in the future as a jumble of buildings. The close proximity of many houses makes it more important that more materials used in house building should be non-combustible.

Using the right materials for buildings in a well planned environment is the best insurance against death and destruction.

Increased oil costs taught big consuming countries a lesson in economising. The most effective action for tropical countries to take, before buying air-conditioners, is to insulate buildings from heat transfer, mainly through the roof, thus reducing the effects of the sun and the sound of rain; which is where it started. □

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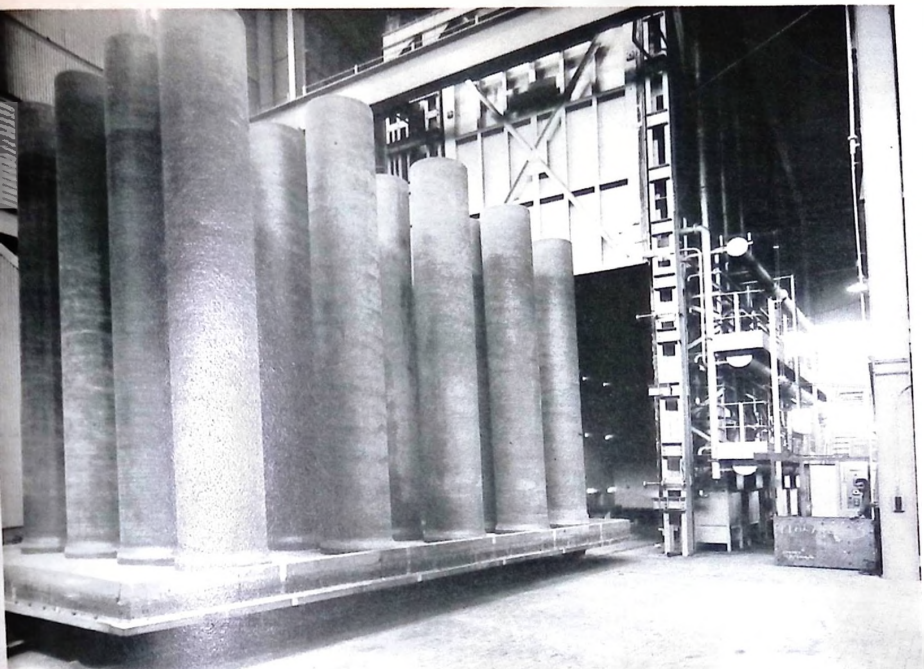
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Large diameter centrifugally spun ductile iron pipes pictured as they enter the normalising furnace.

DUCTILE IRON PIPELINES FOR WATER SUPPLY

Today the majority of the world's water supply networks are still made of cast iron pipes, a testimony to the products of the iron pipe manufacturers. Advances have been made recently with the introduction of spheroidal graphite or ductile iron. This article by a special correspondent looks at the effects these new introductions have had on the mechanical properties of cast irons.

DEVELOPMENTS in iron founding technology provided the impetus which launched the Industrial Revolution in England in the 18th century. As industrialization increased so did the need for public services and one of the first services to be developed was the water supply industry.

In those early days the growth of the industry could not have taken place at the rate it did without the skills and products made available by the growing iron founding industry.

The iron pipe was the foundation on which the water supply industry grew and today the majority of the world's water supply networks are still of cast iron pipes. This situation is a testimony to the products of the iron pipe manufacturers and to the way in which over the years they

have kept abreast of the needs of the developing water supply industry.

Stanton and Staveley Group of British Steel Corporation's Tubes Division has technology, production techniques and product designs. The most important step in materials technology to have taken place in recent years has been the introduction of spheroidal graphite or ductile irons.

Discovery of new process

In 1948 British and American research workers announced the discovery of metallurgical processes which enable the production of cast irons in which graphite in the ferrous matrix of the iron was in

spherical form instead of in the form of thin flakes (lamellae). It is this change in the formation of the graphite which gives ductile iron its much greater tensile strength.

The effect this change of graphite structure has on the mechanical properties of cast irons is very important for it produces iron of considerably higher strength and imparts appreciable ductility, whilst at the same time retaining the traditional properties of corrosion resistance and castability.

The new irons became known generically as spheroidal graphite or nodular graphite irons. When SG iron technology was applied to the production of centrifugally cast iron pipe the definition ductile iron was universally adopted by the

Continued

Continued
iron pipe producers to define their products.

The manufacture, design and use of ductile iron pipes and fittings is covered by international standards and codes of practice, the most widely used product standards being the International Standard ISO 2531 — "Ductile iron pipes, fittings and accessories for pressure pipelines." These standards specify material requirements, dimensional requirements and production quality control procedures.

Mechanical properties

The enhanced mechanical properties of the ductile iron pipe — a minimum tensile strength of 420 N/mm² (approximately double that of its grey iron predecessor) and ductility sufficient for the pipe to sustain significant diametral distortion without suffering damage (a minimum elongation at failure of 10%) were soon recognised by pipeline engineers as a major advance in pipeline engineering. Today, iron pipe manufacturers in the major industrialised nations of the world concentrate almost exclusively on the manufacture of ductile iron pipe to the exclusion of its grey iron forerunner.

Generally pipes can be classified as being either rigid or flexible conduits. Rigid conduits can be defined as those which do not assume significant diametral deflection under earth, traffic, etc. pressures. Flexible conduits are defined as those which are



The Stantyte joint coupled with the use of the efficient hydraulic jointing tackle maintains a high laying rate to the twin 1100 mm diameter rising sewerage mains being laid below ground.

capable of diametral deflection under such pressures, and consequently have greater resistance to external loadings.

Ductile iron pipes have been designed as semi-flexible conduits, which are

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ness the unique combined properties of ductile inherent strength together with ability to deflect diametrically under normal loading. It follows, therefore, that embedment designs for ductile iron elbows are less critical than those required for other materials and perhaps more importantly ductile pipes are more tolerant of accidental deviations from specified embedment and installation practices.

Excellent shock resistance

Ductile iron pipes have excellent resistance to shock loadings — damage during transportation and handling has always been a problem with many pipe materials e.g. asbestos cement, concrete, grey iron and PVC and to compound the problem, the damage incurred does not always become apparent until the installed pipeline has been tested or, in some cases, even after the pipeline has been used.

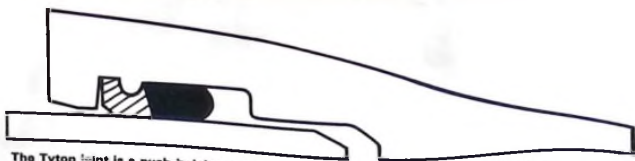
With ductile iron pipes, damage of this type is a very rare occurrence, even when it does occur it can easily be rectified.

The resistance of ductile iron pipe to shock loading continues to be a very important factor throughout the pipeline service life, particularly in regard to its ability to withstand surge, waterhammer and cyclic pressure variations.

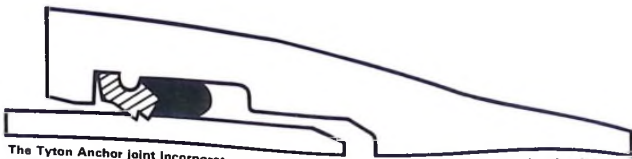
The strength and robustness of the ductile iron pipe is particularly valuable in urban environments, subject to heavy traffic load. Buried pipes in this type of installation are continually subjected to heavy loading which can be almost of a cyclic nature and the ductile iron pipe, unlike pipes made in other materials, have an unsurpassed service record in these conditions.

In addition to the benefits that accrue from the metallurgical advances outlined here, ductile iron pipes embody all the experience and expertise gained by pipe manufacturers since the birth of the water supply industry.

The modern push-in flexible joints used in today's ductile iron water supply



The Tyton joint is a push-in joint and can be deflected up to fine degrees in any direction and employs a specially shaped rubber gasket.



The Tyton Anchor joint incorporates a gasket similar to the standard Tyton gasket in size and shape, but which serves as a corner for integrally moulded stainless steel teeth.

systems, comprise an elastomeric joint ring, usually of natural rubber, which is placed in the socket of the pipe and the joint is made simply by entering the spigot end of the adjacent pipe into the socket. These joints will allow for ground movement caused by settlement or subsidence, and they are capable of axial movement to compensate for thermal expansion and contraction. Recently, push-in flexible joints have been introduced in which self-anchoring mechanisms are incorporated within the joint, thereby obviating the need for external concrete anchor blocks on buried pipelines or tie-bar arrangements on lines laid above ground.

Service connections

Service connections to ductile iron mains are simple, extremely reliable, and they do not require strengthening saddles around the pipe. On distribution mains screwed connections having inlet sizes up to one quarter of the main diameter are available as standard. Ductile iron pipes have good corrosion resistance properties and the standard bituminous coatings applied

during manufacture provide adequate protection for the majority of installations.

Preventing tuberculation

In most cases standard bituminous coating in the bore of the pipe will prevent serious internal attack. Nevertheless, certain waters have a tendency to cause tuberculation in the pipe bore and this can cause a reduction in the main's carrying capacity. In these conditions pipe supplied with a cement mortar lining will prevent the formation of such deposits. In addition to preventing tuberculation cement mortar linings offer very little frictional resistance to the flow of water and the excellent initial friction coefficient is retained throughout the design life of the pipeline. The cost of providing a cement mortar lining is very small and many authorities specify cement mortar lined ductile iron pipe as standard.

Standard bituminous coatings provide adequate external protection in the majority of soils in which pipes are laid but occasionally particularly aggressive soils are encountered, e.g. made-up ground containing ash, clinker, etc., or highly acidic soils. A means of determining the corrosivity of soil is to take readings of its electrical resistivity and the corrosive soils are indicated by low readings. A simple economic method of providing the necessary additional protection in these cases is by polyethylene sleeving, the sleeving being placed around the pipe immediately prior to installation. This type of protection is used extensively in many parts of the world and it is now a standard practice covered by a number of national standards and codes of practice.

The ductile iron pipe was pioneered in the U.K. by Stanton and Staveley and is now firmly established as the leading material for water supply pipeline systems. In the 20 years or so since its introduction its growth in use has been steadily increasing and today ductile iron pipe is giving excellent service in bulk transmission main for raw and potable waters and distribution networks in countless towns and cities throughout the world.



Nearing the West African coast, this consignment of ductile spun iron pipes destined for water supply schemes in Nigeria.

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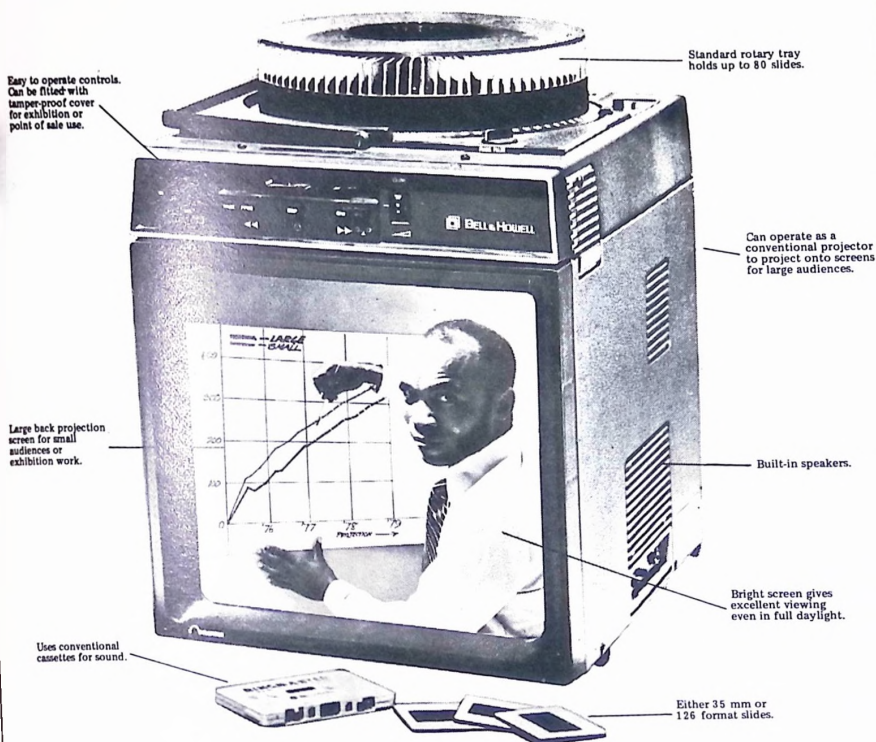


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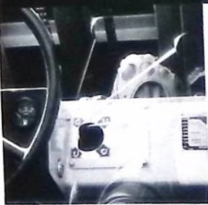
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The Datsun FO2 Proves Big Things Take Place When Nissan Sets Out to Engineer Breakthroughs



Only 1 outstanding feature. That's the trouble with most forklift designs. But total performance determines the true value of materials handling equipment. So, Nissan decided the time was ripe to engineer some changes. The new-generation Datsun Forklift FO2 incorporates a number of super improvements. Attractive, low-profile styling creates double benefits—higher load stability and a lower floor level. FO2 models safely lift their rated standard load to a height of at least

4 meters. Warm white and orange colors bring out the new personality. A smaller minimum turning radius (2,150mm for 2-ton; 2,220mm for 2.5-ton) results from reduced external dimensions. Lifting speed is a stable 490mm/sec*. Which is considered ideal for most jobs. Operator comfort and safety reach new levels. Single-lever tilt/lift, power steering, improved forward visibility and a well-padded bucket seat keep operator fatigue down. The non-slip

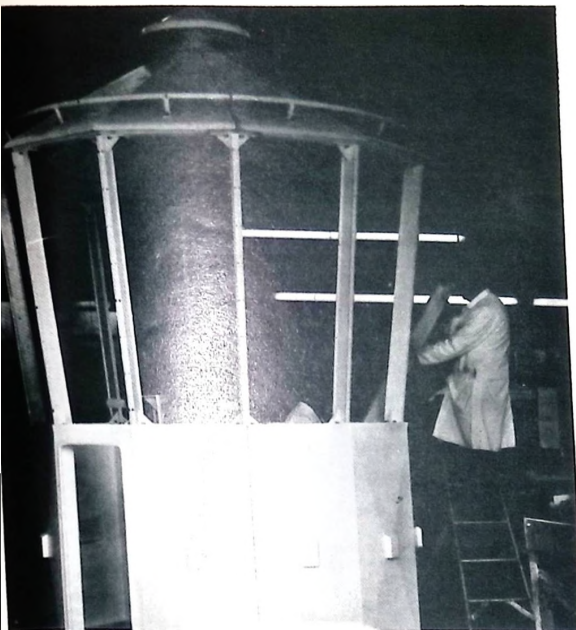
floor mat, rigid overhead guard, rain drip channel and duo-seal self-adjusting brakes instill confidence. Plus other record optional safety equipment is included. Simplified servicing further enhances traditional Datsun reliability. Maximum use of standard-duty components provides long-life operating economy. The Datsun Forklift FO2. It's totally engineered by Nissan for profitable performance.

*Standard gasoline engine

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Glass reinforced plastic is an excellent material for use on lighthouse construction. This lantern is built of non-corrodable material throughout, weighing only 820kg. The design is based on four bolt-together segments for ease of transport and erection.

A GUIDING LIGHT

With the increasing amount of tonnage on the high seas the need for lighthouses in undoubtedly greater than ever before. To-day with the advance in automatic communication equipment and remote supervision by radio and the role of the lighthouse keeper is diminishing. This article by F. Dibley Area Manager West Africa, for AGA Navigation Aids Ltd, looks at some of the most recent developments in lighthouse operations.

NAVIGATION MUST have been a hazardous business before lighthouses and other man-made visual aids came to the aid of the mariner. As late as the last century history is studded with tales of ships lost in places where lighthouses have since been built and now help to save ships and lives.

We are in an age when the need for lighthouses is even greater than before. Watchkeepers on the bridge of a big ship may be lucky enough to have their position fed to them by satellite and have the use of radar but tonnage and draught make manoeuvring difficult and at night

in close waters oil rigs and other vessels may be hard to avoid without the help of a light. At the other extreme the man in the small fishing boat may be closer to the water and able to read the signs of the tide-rip or feel the wake left on an ocean swell by an island but the lighthouse is equally welcome to him and can be the difference between life and death.

Light sources

Lighthouses have great romantic appeal and their construction has often been a struggle between man and nature. Their beginnings are lost in pre-history

but their purpose and that of their guardians, the lighthouse keepers, have always been to show a light, so let us first look at how this has been done.

Iron baskets of burning wood were followed by oil and candles. Imagine a lighthouse burning 800,000 candles at once to equal modern light! Then equipment was developed to burn vaporised kerosene with a bright light. Now gas and electricity are the usual power sources.

Electric lamps started as giant versions of the tungsten filament household light bulb and tungsten lamps are still used though electric discharge and sealed beam lamps have come on to the scene too.

High standards

During the great flowering of the industrial revolution the builder, the blacksmith, the clocksmith and the millwright — to name just a few — came together to become that special person, the lighthouse engineer. He brought to a fine art the use of long-lasting materials and well-tried mechanisms that ensured utmost reliability. Huge optics built up of many lenses mounted in metal frames turned smoothly floating on a bath of mercury driven by a falling weight mechanism straight out of the world of clocks. Where it was found impossible to make a mechanism unailing, it was duplicated and so arranged that an identical or secondary system took over automatically or at least that an alarm bell was sounded.

Today the principles are much the same but advancing technology nibbles away at the old basic problems and better and less costly ways are found of doing the same thing. An outstanding feature of lighthouse engineering is that equipment designed and built fifty or a hundred years ago is so often either still in use or partly in use.

Automation

Now we are in the communications century and automatic equipment and remote supervision by radio or landline mean that the lighthouse keeper is gradually disappearing, replaced by the visiting service engineer, who may well arrive by helicopter.

Lighthouses, like light buoys and other very basic navigation aids are being serviced at longer and longer intervals and the logistics of fuelling and servicing are becoming more and more important.

The light still begins to flash from modern unmanned lighthouses as night falls — how is it done? Probably switching is by a sun valve or photo-electric cell. A sun valve relies on the difference in expansion between bright polished metal and metal finished a dull matt black when exposed to the radiant energy of light. It turns on gas which is ignited in a gas mantle by a pilot jet. The photo-electric cell measures light and operates in an electric system.

Foghorns

Sound signals with radar can substitute

Continued

Continued

for visual aids in bad visibility. Maroons, bells, guns and horns have all been used but modern equipment consists of electrically operated diaphragm sound emitters with either directional or all round sound emission and these are often switched on automatically by a fog detector using a light emitting diode with a solid-state electronic circuit which measures the light reflected back by fog.

Power supplies

Gas and electricity are the two modern forms of power supply for lighthouses. Gas is regarded by many people as superior where the utmost reliability is needed. The impressive thing is that the gas operated equipment, whether burning acetylene or propane, has changed so little since it was introduced some fifty years ago and yet holds it own with electricity, in some cases offering greater reliability, longer life or longer intervals between service visits. This is because moving parts are simple and few and constructed of high quality materials, while the flash mechanism or the turning of the light are usually powered by gas pressure from the gas passing from the supply to the burner and many moving parts are 'washed' by this gas as it passes through. An automatic acetylene gas flasher may have a recommended interval between inspections of ten years but equipment sent back to the factory for servicing may be found to have been in use without maintenance for twenty-five years.



A tanker passing between two unmanned lighthouses in an area much as AGA equipment measures fog density and this information is transmitted to office who is able to keep ships informed by radio.

Having introduced the two main fuels, gas and electricity, it must be stated that there is no best in general terms — everything depends upon the circumstances of fuel availability, servicing facilities, required performance, capital availability and in the case of modernisation work, the existing lighthouse tower and the equipment already installed.

Lamps

Gas lighting equipment is so highly developed that it seems almost unimprovable but there are some new applications of electric lamps. Traditionally the scale-up domestic light bulb with a tungsten filament has been used with an automatic changer that has brought a new lamp into position when the first failed. This type of system in major lights has normally operated within a rotating lens

to concentrate light from the series of rays like the spokes of a wheel seen from one point as a series of flashes, which identify the light. The smaller installation the flasher is produced by flashing the lamp instead and the optical system is stationary. Small high intensity lamps with electronic flashing are frequently used in this way in beacons and light buoys, although they may be used for this application. Tungsten sealed beam lamps used in some cars are now used in lighthouses. They need no heat lens system because they have built in control. The filament is positioned in front of an uncoated parabolic reflector and

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sealed in position. This gives a complete-focused light source with a long and very little falling off in efficiency the reflector cannot corrode and stays bright for the life of the lamp.

Bank or banks of these sealed beam lamps in panels can be rotated to produce required flash. If one of the fifteen or twenty lamps used in a bank fails, the drop in intensity is not great enough to matter and the lamp can readily be replaced at the next service visit. Run at lower than design voltage they have a long life but twenty in an array about one and a quarter metres wide by one metre deep might give a light of 3 million candles. This would be visible at a range of 10 sea miles yet power consumption could be only 3 kilowatts. These lamps and more particularly the simpler but higher efficiency quartz halogen lamps can be very effective where major light-houses must be left unattended for perhaps up to a year and power must be conserved.

Lighting the acetylene gas for the first time at the Market light in the Gulf of Bethina. This fully automatic gas regulation replaces an electric system using diesel generators which has to be tended after by lighthouse keepers.



Turntable lights

In major lighthouses with light sources that are burned steadily without being flashed either a lens must be turned round the light source or a directional light source must be turned if flashes of light are to be seen by an observer. A successful solution that will do either job is the gearless rotating pedestal which offers silent vibration free rotation at speeds of from 1 to 6 rpm using only three watts 12-volt DC. This unit has been installed in some eighty lighthouses in the last decade and has millions of hours service without any reported operational failure.

The gearless pedestal is essentially a very low speed DC motor with electronic commutation and speed control. It has only one moving part, the rotor, which is mounted on a vertical shaft which also carries the turntable. Two drive units operate together sharing the load. Should one unit fail, the other takes the whole load without any changeover mechanism being needed.



This six direction 300,000 candlea light array is under test, powered by the thermo-mechanical generator. In the white trolley on the right. This converts the propane and electricity, to power the lights and operate the electrical gearless turntable.

This equipment has advantages that make it suitable for two extremes, one the remote and often inaccessible lighthouse station and other, the lighthouse on the roof of flats or an hotel. In the latter case silence and freedom from vibration are important but infrequent servicing is valuable here too.

Alternative energy

Where no mains electricity is available and gas or fuel for diesel generators cannot be delivered easily by sea or land there is great pressure to find practical methods of taking and converting energy from the sun, the wind, tidal flow or ocean swell. Wind power and wave power can now be viable propositions. Solar energy using solar cells is also on the verge of becoming useful for lighthouse use.



Checking the timing of light flashes from acetylene light units under test at the AGA factory, UK.

Until these power sources can produce sufficient electricity for a lighthouse with absolute reliability, replaceable electric batteries, gas in tanks or diesel oil in tanks will be the power source. One interesting

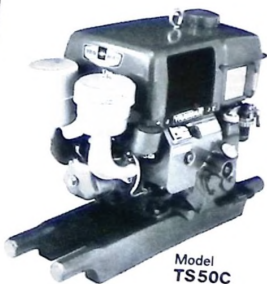
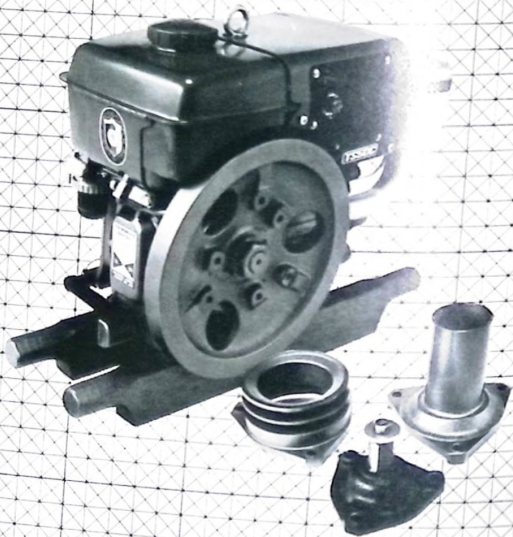
development coming on to the scene however is the thermo mechanical generator or TMG (not to be confused with thermo nuclear or thermo electric generators). The TMG uses the Stirling cycle heat engine to convert propane gas to electricity with an astonishingly high efficiency of 60 watts AC output (maintained 56 watts over a 14-hour night) from only 990lb. (450kg) of propane per year. Maintenance is confined to cleaning the propane burner annually as there are only three moving parts. These are dynamically balanced to vibrate at a natural frequency of 100Hz and there is consequently no frictional wear or need for lubrication.

High rise lights

Lighthouse buildings usually reflect their function and their situation. The wooden or stone lighthouse was followed by modular cast iron, by steel lattice, by slip formed concrete, and latterly by glass reinforced plastics. The new sim fibre-glass lighthouse without any need for keeper accommodation may well be delivered by helicopter in sections. Suitably situated high rise buildings are always considered when looking for sites for new lighthouses if only because they may well obscure it if it is put anywhere else.

Lighthouses may be becoming different from their established image but the need for them is as great as ever it was. New techniques and equipment make the preparation of a specification for a new lighthouse a fascinating intellectual exercise but whatever performance may be required, there is one factor by which the light will be judged above all other and that is reliability. □

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COMMERCIAL VEHICLE — CRANE FRUEHAUF



A deep frame and high floor are characteristics of the tippers exported by CF for on/off road operation

Late in 1977 the UK-based Crane Fruehauf company was taken over by the world's largest trailer maker, the American Fruehauf Corporation which until then had held a minority shareholding. Here Alan Bunting looks at CF's export activity, in West Africa.

WHEN CRANE FRUEHAUF was formed as a company some 12 years ago, its product range extended only to trailers — most of them articulated semi-trailers, with the emphasis at that time on extra heavy-duty designs intended for hauling industrial and construction plant.

Since that time, CF has expanded its activity into other types of road transport equipment. In the process it has acquired a number of smaller companies, notably in the truck bodybuilding field. Crane Fruehauf has also acquired the manufacturing rights to some more specialised equipment including the Pengco swap-body system (closely related to the Ackermann system produced in Germany by what is now another Fruehauf subsidiary).

Of more immediate interest to transport users in West Africa, CF now manufactures the well-known Holmes range of "wrecker" (or recovery vehicle) equipment. The CF range of wreckers covers single and twin-boom designs, with lifting capacities from 1 to 40 tonnes. They are all produced as self-contained units ready for mounting on any suitably-

dimensioned chassis of appropriate weight capacity. The lightest single boom models are designed for mounting in the loadspace of Land-Rovers, Land Cruisers and mass-produced pick-up trucks.

At the opposite end of the weight spectrum the 40 tonne-lift Holmes wreckers have been sold by CF for mounting on Mercedes chassis, through the Nigerian Mercedes-Benz distributor, Leventis Motors Ltd.

Crane Fruehauf reports an upsurge in demand for its wreckers, broadly in line

with the growth in truck population. Despite the considerable road-building programmes now going ahead in Nigeria and other West African states, there remain many major roads in the interior which are steeply cambered with deep rain-wash gullies down each side where overturned trucks are a regular sight, and recovery equipment is needed.

For West African markets much of CF's business is in the company's traditional type of heavy machinery carrying trailer.

continued

A full-width roller along the rear edge of the deck is a CF option intended mainly for offroad applications



continued

They are mainly of step-frame configuration with a deck level as low as the outer diameter of the tyres will permit. On the 25 tonne capacity CD2 tandem-axle unit on 10.00-20 16 ply tyres for example the main deck height is only 1060mm. A short "beaver tail" can be incorporated as an option in these models with so-called peep-through tyres, enabling optional hinged or separate run-up ramps to be used for loading mobile plant.

A choice of platform lengths is offered on most of the CF step-frame and flat-bed trailer models. To take the CD2 25-tonner as an example, four overall lengths are listed: 11, 11.5, 12 and 12.5 metres. Behind the 766mm-deep frame step, deck lengths are, respectively, 8100, 8600, 9100 and 9600mm.

Heavier-duty versions of the CD2 and CD3 trailers are available, of similar configuration except that for 40, 45, 50, 55 and 60 tonne payloads, three-axled running gear is employed. Total length is increased accordingly — on the longest 60-tonner to 15 metres. Deck lengths on this version vary from 9400 to 11200mm and because of the heavier wheels and tyres (12.00 20, 18 ply), the deck height is increased to 1120mm.

The heaviest CF step-frame trailer listed carried 70 tonne loads and has a four-axled bogie and a choice of main deck length from 11.2 to 13 metres.

For the heavier step-frame models correspondingly heavy tractor units are implied because the designed king-pin loading into the fifth-wheel coupling of the tractor is well above normal haulage operation levels — as much as 35 tonne on the big 70 tonne payload CD4.

General freight movement

For general freight movements CF produces a range of straight platform trailers which differ from the company's UK domestic market models in being of more rugged construction and with simpler auxiliary equipment. For example the landing legs are usually of the folding type rather than telescopic.



To suit the rugged ground conditions experienced on construction projects an oilfield development the running gear employed has articulating two-spring suspension with a built-in margin for overloads. Payload capacities on these straight frame CF trailers vary from 27 to 45 tonnes. The load bed on standard models varies from 9.5 to 12.2m long. Corresponding king-pin to bogie centre dimensions are 7.12 to 9.87m. Because the trailers have an



On the lighter step-frame CF machinery trailers the deck height is kept low by having 'peep through' tyres.

unusually deep underfloor structure, with main rails up to 640mm deep, the loading height is greater than would be found on lighter duty trailers used in Europe for wholly on-road transport — in fact up to 1780mm.

Options listed by Crane Fruehauf for the flat bed trailers include fat single tyres in

place of twins and, on the longer so-called oilfield float construction, a rear loading roller and running raves. Stake sides can be supplied at the requirement of timber haulage construction companies carrying sea-folding.

In the United States the Fruehauf trailers from Fruehauf are popular company's tipping trailers. The auxiliary dominates the domestic semi-trailer tippers and, not surprisingly, export successes in the latter have come from the sale of complete units which share the main features of the market designs. The tipping feature radiussed bottom corners and piece ribs which combine the sides of the floor crossmembers.

Built to last

For West Africa CF uses a construction unless otherwise specified interests of general ruggedness in repair. The tipping trailers, standard models for 30 and 40 tonne payloads, have extra deep, which not only provide the strength needed on rough sites give the high floor level required into hoppers or road-making. The standard 30 tonne model with two different bodies; the are 18.3 and 23cu m, while the are of essentially the same construction fitted with a 24.5 cu m body. Both types feature a five-sta tipping ram recessed into a "d" front bulkhead, which ma capacity within a given overall.

Powder and liquid tankers an important side to Crane Fruehauf business and a number of petroleum tanks have been supplied. Petroleum Haulage (Nigeria) Apapa. Of mild steel, for construction, they are capable of holding 36,400 litres. Mobile bulk silos holding 116 cubic metres products like cement, or discharge hopper tanks of 116 metres capacity, also feature.

It is with this type of sophisticated product, and insulated and refrigerated van semi-trailers, that Cr



Stake sides are available as an option on the heavy flat-deck trailer models in the CF range available in West Africa.

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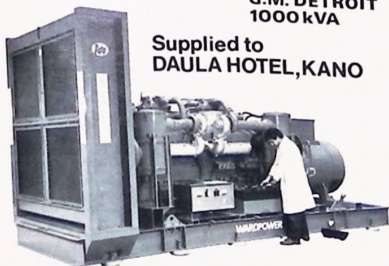
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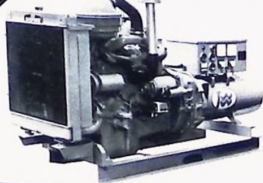
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Instrumentation product digest

Tester reveals inductive and anti-static properties

Testing of the working environment, objects and equipment for conductive and anti-static properties is made possible by a portable tester introduced by **BTR Silvertown**.



According to the manufacturer, one of the most important applications of the unit is the testing of anti-static and conductive footwear where they are worn. Previous systems have involved cumbersome and expensive installations, involving special visitations. The battery operated tester is housed in a lightweight box. Linked to this by a cable is a folding platform which provides alternative wet and dry testing surfaces. To provide a reading for the conductive of anti-static properties of footwear, the wearer just stands on the platform.

Frequencies to 35 MHz measured

A five-digit timer-counter from **Gould Advance Ltd.** provides frequency measurement up to 35 MHz with high reliability and easy access for maintenance.



Facilities offered by the **TC 320** include frequency, single-period, multiple-period and ratio measurement, together with counting and totalising. Extensive use is made of low-power C-MOS

and Schottky circuitry, plus thick-film resistor networks and an open-plan component arrangement, to ensure reliability and ease of maintenance.

Frequency measurements up to at least 35 MHz are simple with the clear, seven-segment display. Single- or multiple-period facilities can be selected for lower-frequency measurements, and the count mode totalises regular or random events up to a 35 MHz rate.

The high-impedance 10 V input is enhanced by range selection facilities and a 'disciplined' trigger function; the display indicates if a signal is insufficient for correct operation of the amplifier. Input facilities include automatic gain control, with sensitivity automatically adjusted to give optimum triggering. For further information contact **Mesacom Electronics Industrial Ltd.**, Lagos.

Microprocessor-controlled h.f. receiver

Incorporating microprocessor control into their range of HF radio receivers has enabled **Philips** not only to simplify control, but also to provide such outstanding features as tuning-in to any frequency merely by pushbutton control; up/down sweeping; auto search; instantaneous selection of pre-programmed frequencies, and simple remote control over 2-wire telephone lines.



Tuning, down to an accuracy of 1 Hz, is by means of a keypad, a tuning knob and 'up' and 'down' buttons. Up to 10 frequencies can be tuned in and stored in a non-volatile memory (RAM) for instant channel changes later; a pre-programmed channel change takes no more than a few milliseconds. The processor intelligence is concentrated in a factory programmed read-only memory (PROM). The inter-

face between the processor, the keypad and the frequency synthesizer presents simple, addressable buffer inputs and latched outputs. The remotely controlled version incorporates additional input and output ports to convey **REFAF** meter readings and to cope with all the functions of the frontpanel switches for HF filters, mode selection.

Clutter free marine radars

Automatic removal of sea and rain clutter is offered in the latest range of marine radars developed by **Decca Radar Ltd.**

Called **Clearscan**, the radars are available for 230, 305 and 405mm solid-state display screens operating on 3cm or 10cm wavelengths. They are thus suitable for use on coasters, fishing vessels, large yachts and workboats, as well as bigger ships, operating at sea or on large lakes.

Sea and rain clutter is removed by a video processor known as **VP1**. Another pro-



cessor — **VP2** — to be introduced shortly as an optional extra, clarifies still further the display produced by the **VP1** unit in four specific ways: suppressing receiver 'noise' from a vessel's own radar equipment; suppressing interference from the radars of other vessels; brightening weak echoes; and enlarging (stretching) echoes on long-range scales. Between them, these two video processors are claimed to virtually eliminate — automatically — all the major remaining difficulties encountered on ships' radar displays when operated under adverse weather conditions. Both **VP1** and **VP2** units can be fitted to the firm's earlier solid-state models. For further information contact, **Associated Engineering Services Ltd.**, Apapa.

Compression Testing?



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If you test for compression send for our literature on the range of compression testing machines we can offer. We are the world's leading suppliers of weighing and testing machines and our unrivalled experience is available to you now.

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We may know a better way of doing it.



AVERY

Avery Nigeria Limited Obasa Rd. PO Box 2
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Agriculture Digest

Trailer Sprayer

A tractor-mounted sprayer from **Dorman Sprayer Co Ltd** has a capacity of 1700 litres which equals that of the biggest trailer sprayers designed for regular coverage of large areas. The Tri-Tanker carries 550 litres in each of its two saddle tanks, mounted on either side of the engine, and a further 600 litres in its rear tank.

With this capacity, the equipment can deal with large areas in a single operation without refilling. As it is tractor-mounted and not trailed, it reduces wheel damage to standing crops.



The saddle tanks can be used separately with gravity feed or small pump for soil injection. With the tanks in position, the rear sprayer can be demounted so that the tractor can be used on its own. Demounting, or mounting, of the complete spraying system takes under an hour, and the rear unit may also be used independently of the saddle tanks. The latter are easily swung clear for maintenance to give unobstructed access to the tractor engine.

All tanks can be filled directly by suction from containers. Each tank incorporates a large manhole, suction filter, collecting balance pipe and anti-surge mechanism. Among other features are balanced agitation to each tank and a balanced return-flow mechanism.

Hydraulic plough excels in difficult conditions

A hydraulic disc plough manufactured by an Australian company, **John Shearer Limited**, operates in all ploughing conditions and has deep discs for improved efficiency in heavy clay.

The plough, called the **5GP** model, is the culmination of an extensive research and development program aimed at improving the traditional broadacre

single disc plough. Fingertip controls enable the operator to match the plough's operation to ploughing conditions from the tractor seat.



The plough has three individual hydraulic circuits which allow instant control of the disc pressure, width of cut, and the raising and lowering of the whole plough. The hydraulic stump jump mechanism gives greater ploughing economy. The strongly built unit incorporates hydraulic loading on each individual disc jumper. Primary cultivation requires heavy settings while secondary or soft sand soils require less jumper pressure. For more information contact **Australian High Commission, Lagos**.

Stone and clod separator

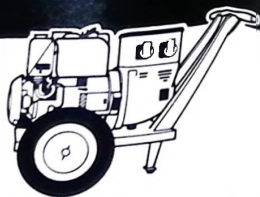
A tractor drawn hydraulically operated stone and clod separating machine developed by **Reckie Engineering Ltd** is claimed to clear soil of 90% of its stones and clods, leaving behind only small fragments with diameters of less than 25 mm.



The fine tilth thus created improves the planting and growing conditions for potatoes and other root crops such as onions, carrots, sugar beet, facilitating their manual harvesting and greatly speeding up their mechanical harvesting.

Operating from the p.t.o. (power take-off) of any tractor with a minimum capacity of 50 kW (66 hp), the machine clears soil at the rate of 0.4 ha/h leaving two furrows free of stones and clods in its wake, ready for planting by manual or mechanical means. The machine's working width is 1.8

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Wire-mesh collar converters for pallets

Wooden pallets can be converted into cages of variable height with collapsible wire-mesh collars introduced by Alletower (GB) Ltd. Pallet-collars have a standard height of 280mm and are easily fitted singly or in multiples to conventional 1m x 1.2m pallets or other sizes according to customer requirements.



Although light and easy to handle, the collars withstand heavy loads transmitted from superimposed pallets. The manufacturers recommend that pallets carrying a maximum load of 1-t with a single collar should not be stacked more than three high and those carrying a 2-t load with a double or triple tier of collars should not be more than two pallets high.

Constructed of steel with an electroplated zinc finish, the mesh collars are designed for long service in both storage and distribution applications. A hinged gate can be provided for access when stacked. When not in use, units can be folded flat and nested with about 30 on one pallet.

Security system for airlines

Designed to replace an airline's normal check-in desk, a combined passenger check-in point, baggage weighing and security X-ray screening system is claimed to offer the advantages of electronic weighing with digital readout, plus simultaneous X-ray security examination facilities.

Called the X-30, the International Aeradio Ltd. system comprises a main check-in/weight platform/X-ray chamber, and a TV monitor and X-ray chamber control desk. Using the system, it is possible for one airport security guard equipped with a

single TV monitor to control several passenger check-in points.



Passenger luggage is placed in the inspection compartment of the system, the doors are closed, and the contents of the baggage are instantly displayed on a 510mm high-definition television monitor. The camera has a zoom and tilt facility which allows close-up inspection of any part of the baggage contents.

Once the contents have been passed as acceptable, the doors can be opened by the check clerk and the baggage passed on to the airport's main conveyor belt at the press of a button.

Generators cut noise and cost

A new range of transportable generating sets from Dawson-Keith offering low noise levels at very competitive cost makes its debut at the Middle East Construction Exhibition held in Dubai.



The sets in the new Dawson-Keith LN range have Perkins diesel engines and offer outputs from 16 to 70kVA. Each is fitted with a sound-attenuating canopy which, the company claims, provides the best available balance between substantial noise reduction and reasonable cost.

The attractively styled canopy is insulated internally with a 25mm. thick sound absorbent foam lining sealed by a polyester membrane with an aluminium facing. Double access doors are fitted and one incorporates a large glass inspection panel. Air inlet and outlet attenuation louvers fitted at each end of the canopy are 12m. deep and a 'residential' silencer is fitted above it. For further information contact Afrotec Technical Services Nigeria Ltd., Yaba.

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KADUNA, KANO.

Footwear Digest

Shoe-thread bobbin dispenser

Shoe and Allied Trades Research Organisation has developed a dispenser for pre-wound thread bobbins to save machinists' time and help reduce thread wastage in shoe stitching and other industrial sewing tasks.

Up to now, storage problems have often led to excessive wastage of thread from part-used pre-wound bobbins. This wastage had to be offset against the inherent advantages of these bobbins which accommodates up to 70% more thread than metal-flange types and thus save operator time. Moreover, the pre-wound bobbin is wound under even tension.

The SATRA dispenser provides five vertical columns to keep apart bobbins of differently coloured thread. Each column accommodates ten full bobbins (sufficient for 3-6 hours' machining) and provides a convenient storage facility for part-used bobbins that might otherwise be thrown away. A simple diameter-gauge shows whether a bobbin holds enough thread for economic use, and the dispenser's transparent front enables its contents to be checked visually.

Swing-arm cutting press

Ease and safety of operation are claimed as outstanding features of an electro-hydraulic swing-arm cutting (clicking) press developed by Cox and Wright Ltd., for use in the footwear and other industries.



Known as Series 1, the press is available in two versions — models CW116 and CW120 —

providing 1.1kW and 2hp) respectively. Each model is with cutting 380mm. SRA giving users a cutting force arm to suit requirements.

Controls are easy-to-follow. The bobbins are mounted on the friction swing arm stroke can be between 10mm and both stroke adjustment operation of the electronically controlled press can operate the touch button incorporated in the right handles of the arm are touched automatically, ensuring bobbin easy control.

Audio-visual system to train shoe pattern cutter

A training system for footwear manufacturing train pattern cutters more quickly and more than by other methods offered by the Shoe and Trades Research Association's overseas members.

The SATRA pattern training programme concentrates on providing the trainee with a basic core of knowledge and practice in the skill of pattern cutting so that after a few days of training he or she can produce a set of paper patterns and a sample pullover.

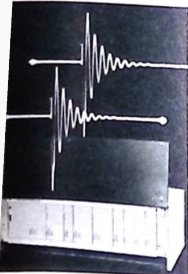
Various ways are used in the programme. Excellent information is presented on cassette tape synchronised with a series of slides. In addition, a workbook directs the trainee on certain tasks to utilise the tape and information. By answering questions and performing tasks, the trainee extends his knowledge and abilities. The programme produces a ready reference manual for future use.

The modular structure of the programme means only those parts necessary to an individual trainee need be followed, giving maximum flexibility. Furthermore, the training need not be full-time. Activities being carried out both during and between training periods.

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ings shafts of prime
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ly monitored. The shaft
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tively, absolute and as resul-
t values.



The vibrations produced in
prime movers and driven
machines by rotating parts
are mainly shaft and bearing vibra-
tions. They must be carefully
measured and constantly moni-
tored to enable harmful
effects to be recognized early
and corrective measures to be
taken. The immediate sur-
roundings must likewise be
protected from harmful vibra-
tions. For further information
contact Siemens (Nigeria) Ltd.,
Apapa.

Modemulators offer low-cost alternative

The new 1622 and 1623 syn-
chronous modemulators from
Nolton Communications Ltd.
have been designed to replace
high-speed narrowband syn-
chronous modems for intra-
city data communications over
privately owned 4-wire cir-
cuits. A pair of the Nolton
units could be used instead of

a pair of conventional modems
for communication over dis-
tances of up to 16km.

Differential current drivers
are incorporated to minimise
error-rate problems and to
ensure high noise immunity
when used with a balanced
two-wire twisted pair system.

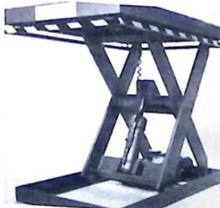
The units are compatible
with standard V24 or V35
(1,622 only) data-terminal
equipment interfaces, and
allow selection of half or full
duplex mode of operation.
Speeds may be selected from
2,400 baud to 4,800 baud, and
the equipment, which can
operate without a DC connec-
tion, utilises a novel data
encoding technique.



The modemulators can be
used with high-speed main-
frame, for remote plant work-
ing, for site of terminals etc.
Several remote stations
can be connected to a single
base station by use of the
multipoint facilities built into
the unit. Built-in diagnostic
facilities include a pseudo-
random pattern generator.

'Big bronze' scissor lifts

Newly-developed scissor lifts,
launched under the name 'Big
Bronze' by TI Becker Lifts
Ltd.



The range is from 500 to
10,000 kg capacity with a
choice of 50 different units
each carefully selected to offer
the most usual requirements of
industry. Additionally, a special
engineering team has the
capacity to design lifts to meet
individual needs. The Super
Compact 2 tonner has a 127cm
x 86cm table, height closed
25.4cm, open 104cm. The 2
ton Work Horse has a table
244cm x 122cm, height closed
31cm, open 188cm.

Look what's NEW in window covering!



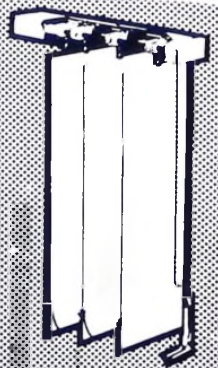
vertical blinds

You might think there is a curtain in
front of the window! Wrong! It's the
new LUXAFLEX, Vertical Blind. But
it is quite pleasant to look at. That is
because of the material of the vertical
vanes. They are made of fabric which is
vinyl impregnated and therefore makes
them easy to clean. The vanes can be
adjusted both ways for effective light
control.

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VOLVO BM loaders have a range of attachments that solve your most difficult problem in the most difficult terrain. If you have to move big loads, you should choose a loader with snap-on-coupling that allows 60 second attachment change.

VOLVO BM loaders have a reputation for ease of maintenance. This cuts downtime costs. Volvo loaders are built to provide long life and reliable machine operation - this increases your productivity.

For you, a VOLVO BM loader means one thing - big productivity!

The VOLVO BM loader equipment range includes articulated wheel loaders, 18 tons as well as articulated trucks and terrain crawlers.

VOLVO VOLVO BM AB, ESKILSTUNA

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Volvo BM 846 Loader
Engine rating 92 kW (125 hp)
Bucket capacity 1.7-3 m³
Weight 10250 kg

**duct
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admittance**

The solenoid-operated air lance valve, the Edwards IE, occupies less than half space of the equipment it replaces and provides the facilities, for lower cost. This is achieved through use of a small built-in rectifier which allows the valve to be operated on a.c. supplies. The previous model could only be operated on a.c. current via an independently mounted rectifier which had to be purchased separately.



The PVASE can be operated from a.c. or d.c. current with equal facility simply through choice of appropriate terminals. It opens when de-energised and thus provides vacuum systems with automatic air or gas admission in the event of power failure.

The valve is supplied complete with the latest SC5 couplings and can be connected to pipelines by brazing or soldering or "muff" coupled with the addition of a compression ring accessory. For further information contact Naafco, Lagos.

Trailer floodlight

A trailer for high-speed towing is quickly converted into a 10m high floodlighting tower with its own generator and four 1000-W lamps. Although principally designed by its manufacturers G. Pike Ltd. for use on construction sites, Skylight is sufficiently compact to be rushed

by police vehicles to a road accident and is rugged enough to be hauled cross-country to a cliff rescue or similar emergency.

One man can erect the telescopic mast so that the floodlight is operational within minutes of its arrival. All that is needed is to unhitch the trailer and set its three stabilising jacks which can be locked only when they have been fully extended to provide maximum stability. The top mast section is then pulled out and the lights checked.



fiber-clad power lead upwards automatically as the top mast section is pinned into place, and the mast is winched up by hand; the same winch is used to extend the middle section of the mast which is also pinned at full height. Three wire stays, already connected, are tensioned by ratchet winder to steady the equipment.

Fully erected, the structure is said to be less vulnerable to accidental damage and safer in use than conventional lattice-tube light towers. It combines the best design features from yacht masts and conventional trailers. Thus the trailer has a 3.65 m long central spine of square hollow-section steel with a welded-on cross member carrying two independent suspension units. The spine, which pivots for horizontal



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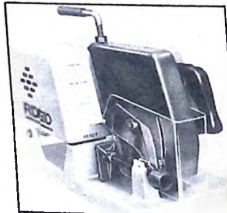
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41 Jebba Street (EAST) E.B.
Phone: 41712

travel, contains another hollow steel section into which the aluminium top mast slides.

Chop Saw

The Ridge Tool Company, has announced the immediate availability of the new RIDGID No 964 Chop Saw for plastic pipe and conduit.

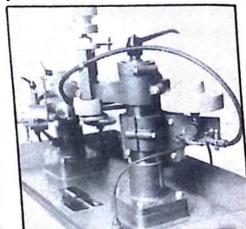


Designed for general construction and utility work, and quality built for the professional user, the 964 Chop Saw has the capacity for cutting plastic, fiber-reinforce materials and non-ferrous metal stock including pipe, tubing, bars in any direction. Featuring heavy duty construction and a husky single phase 120v 60 hz 3/4 hp induction motor (alternately a 230v 50/60 hz motor is available), the saw is sufficiently light weight 20.4 kg to be easily portable, or can be bench mounted.

Grinder for woodworking tools

A low-cost grinding machine developed specifically for reshaping tools used in the woodworking, plastics and allied industries has been introduced by Automatic Grinding Machine & Engineering Co Ltd. By restricting the machine's application to such tools the makers claim to have filled an important gap in the grinding tool market by offering users a smaller, less expensive and less complicated alternative to a universal grinding machine.

Known as the Autoool model TCT/11, the machine enables edge tools such as router cutters, dowel drills and various types of boring bits to be re-sharpened quickly, and in quantity, with a high degree of precision.




Compared with a universal machine — which can cost up to ten times more — the TCT/11 is quicker and simpler to operate, requiring less skill on the part of the operator since no complicated setting up or adjustments are necessary. It is powered by a totally enclosed fan-cooled 0.25 kW (1/3 hp) electric motor.

Freeze drying process speeded


A new heat control device by Edwards High Vacuum greatly improves the reliability and speed with which substances can be freeze dried. It can cut drying time for some common products by more than half, and renders obsolete the traditional methods of determining safe drying temperatures for complex substances.

The instrument, named the Edwards Resistivity Controller, determines the lowest eutectic point of a substance (the temperature at which it completely solidifies) by monitoring its resistance, which varies with its physical state. The principle relies on the fact that there is a sudden change in resistivity at a eutectic point.

For more information contact Naafco, Lagos.

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buyers' guide

A guide to services and supplies for buyers in West Africa

Organisations involved in supplying or servicing industry, government or commerce may be listed in this guide for a period of 12 months at: Naira 75.00, Cedes 135.00, Leone 100.00, \$125.00, or equivalent per listing. For entry form see page 157.

CLASSIFIED INDEX

Full addresses listed alphabetically on following pages.

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Biseca Enterprises Ltd., Apapa.
Landmark Industrial Supplies Limited.

A. C. Motor Starting Capacitors

Daly (Condensers) Ltd., Dorset, UK.

Accounting Machines & Systems

GBO BEAM (a Division of UAC of Nigeria Ltd.), Lagos.
Leventis Technical Ltd., Lagos.

Adhesives

Bostik Ltd., Leicester, UK.

Agricultural and Electrical Appliances

W. A. Dizenhoff (Nigeria) Ltd., Apapa.
Makin Ltd., Ilupeju.

Agricultural Equipment

Afrotec Technical Services (Nigeria) Ltd., Isolo.
J. Allen & Co. Ltd., Apapa.
Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Biscoe (Nigeria) Ltd., Agricultural Equipment Dept., Iganmu.
W. A. Dizenhoff (Nigeria) Ltd., Apapa.
Hallan Graders, Leicester, UK.
Leventis Motors Ltd., Apapa.
Makin Ltd., Ilupeju.
Morpel Industrial Corp. Ltd., Apapa.
NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Bewac Limited, Apapa.
Leventis Motors Ltd., Lagos.
Nigerian Motors, Apapa.
UTC Technical Division, Apapa.
Waateco Ltd., Technical Division, Lagos.

Air Cargo Services

IML Airchartering (Nigeria) Ltd., Lagos and Kano.

Air Courier Services

IML Airchartering (Nigeria) Ltd., Lagos and Kano.

Air Compressors & Pneumatic Plant

Blackwood Hodge (Nigeria) Ltd., Apapa.
R. T. Biscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Guthrie (Nigeria) Ltd., Lagos.
Joy Manufacturing Co., USA.
Rulam Limited, Lagos.
R. T. Biscoe (Nigeria) Ltd., Apapa.
Holman Brothers (Nigeria), Apapa.
Phoenix Motors Ltd., Lagos.
Waateco Ltd., Technical Division, Lagos.

Wayne (West Africa) Ltd., Apapa.

Air Conditioning & Refrigeration

Adesoye Adejebi T. S. Ltd., Ibadan.
Drake & Scull (Nig.) Ltd., Lagos.
Equip Ltd (a Division of Sons of Nigeria Limited), Lagos.
Haden Nigeria Ltd., Yaba.
Haven Nigerian Computer Co., Lagos.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
Mandilas Limited, Apapa.
Nigerian Engineering Works Ltd., Port Harcourt.
Norman Industries Ltd., Ikeja.
Morpel Industrial Corp. Ltd., Apapa.
Patterson Zochons & Co. Ltd., Lagos.
R. & A. Services (Division of UAC Ltd.), Lagos.
VYB (Nigeria) Ltd., Apapa.
Waateco Ltd., Technical Division, Lagos.

Aluminium Doors & Windows

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Alumaco Aluminium Manufacturing Company of Nigeria Limited, Apapa.
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R. T. Biscoe (Nigeria) Ltd., Technical Department.
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Matori — Osodi.
UTC Technical Division, Apapa.

Asphalt Plants

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd.
Morpel Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.
Tarpaulin Industries (WA) Ltd., Apapa.

Audio Visual Equipment

Controls and Automation, Apapa.

Automotive Parts

J. Allen & Co. Ltd., Apapa.
Leventis Motors Ltd., Apapa.
NITECO, Apapa.

Bearing Metals

Makin Smelting Co. Ltd., Jos.

Biscuit Ovens & Equipment

Makin Ltd., Ilupeju.

Bitumen Boilers & Distributors

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M. & E. (a Division of UAC of Nigeria) Ltd.
Morpel Industrial Corp. Ltd., Apapa.
NITECO, Apapa.

Block Making Machinery

Afrotec Technical Services (Nigeria) Ltd., Isolo.
M. & E. (a Division of UAC of Nigeria) Ltd.

Boilers

VYB (Nigeria) Ltd., Apapa.

Bottling Machinery

Makin Ltd., Ilupeju.

Building & Civil Engineering Contractors

Akaka & Akaka Contractors Services Ltd., Lagos.
Constant West Africa Ltd., Lagos.
Cubins Nigeria Limited, Lagos.
George Wimpey & Co. (Nigeria) Ltd., Lagos.
Aljay M. R. Shiru & Sons Ltd., Lagos.
Structor, Apapa.
Taylor Woodrow of Nigeria Ltd., Lagos.

Building Materials

Bewac Limited, Apapa.
Biseca Enterprises Ltd., Apapa.
Challaram's Building Materials Department, Apapa.
W. A. Dizenhoff (Nigeria) Ltd., Apapa.
Danup Nigerian Industries Ltd., Ikeja.
Fibreplus, Reinforced Plastics Co. Ltd., Abokute.
Leventis Motors, Lagos.
Nigerian Commercial & Industrial Enterprises Limited, Lagos.
Nigerian Foundries Limited.
Henry Stephens Builders' Merchants, Apapa.
C. Zard & Co. Ltd., Lagos.
Minster Technical Services (Nigeria) Ltd., Kano.

Business Services

Recruitment

Business Travel Agents

Air Marketing International Group of Co's, Crawley, UK.
All Counties Business Agency, UK.

Catering Equipment

Leventis Technical Ltd., Lagos.
Nirexim GmbH, Vienna.
Plantech Food Service Equipment Ltd., London.
F. Steiner & Co. Ltd., Lagos.
VYB (Nigeria) Ltd., Apapa.
C. Zard & Co. Ltd., Lagos.

Cement Manufacturers

Calabar Cement Co. Ltd., Calabar.

Chemical Engineering

Heplac Nigeria Ltd., Lagos.

Civil, Electrical & Mechanical Engineers & Constructors

Haden Nigeria Ltd., Yaba.
James Kilpatrick (Nig.) Ltd., Lagos.

Compactors

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.

Holt Engineering Ltd.
Leventis Motors Ltd.
Morpel Industrial Corp. Ltd.
Nigerian Motors Industries Ltd.
Apapa.
NITECO, Apapa.
Henry Stephens Engineers Ltd.
Ilupeju Industrial Estate.
Structor, Apapa.

Computers & Services

GBO BEAM (a Division of UAC of Nigeria Ltd.), Lagos.
Haven Nigerian Computer Co., Lagos.
Leventis Technical Ltd., Lagos.

Concrete Machinery

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Holman Brothers (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd., Apapa.
Morpel Industrial Corp. Ltd., Apapa.
Henry Stephens Engineers Ltd., Ilupeju Industrial Estate.
Structor, Apapa.

Concrete Reinforcement

Nigerian Wire Industries Ltd., Lagos.
Fibreplus Reinforced Plastics Co. Ltd., Abokute.

Containers & Tins

Fibreplus Reinforced Plastics Co. Ltd., Abokute.

Corrugated Boxes

Polythene Enterprises (Nigeria) Ltd., Ikeja.

Cranes, Ropes & Hoists

Excavators

Afrotec Technical Services (Nigeria) Ltd., Isolo.
Blackwood Hodge (Nigeria) Ltd., Apapa.

Conveyancer (Nigeria) Ltd., Apapa.
Holt Engineering Ltd., Apapa.
Henry Stephens Engineers Ltd., Ilupeju Industrial Estate.
Holt Engineering (a Division of UAC of Nigeria) Ltd., Apapa.

Leventis Motors Ltd., Apapa.
Nigerian Motors Industries Ltd., Apapa.

Stronghold (Nigeria) Ltd., Lagos.
Services Division, Dept. Waateco Ltd., Technical Division, Lagos.

Cutting & Bending Machines

Afrotec Technical Services (Nigeria) Ltd., Isolo.

Dewatering Wellpoint Equipment & Services

Morpel Industrial Corp. Ltd., Apapa.

Diesel Generating Plant

Adesoye Adejebi Trading Services Ltd., Ibadan.
Afrotec Technical Services (Nigeria) Ltd., Isolo.

Blackwood Hodge (Nigeria) Ltd., Lagos.
Sales and Service Division, Apapa.
R. T. Biscoe (Nigeria) Ltd., Technical Department, Matori — Oshodi.
Holt Engineering Ltd., Lagos.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd., Kano.
Minister Technical Services (Nigeria) Ltd., Kano.

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onkhi Nigeria Limited.
akib (Nigeria) Ltd., Engineering
Services Division, Ikeja.
ector Technical, VYB (Nigeria)
d, Apapa.
anteo Ltd., Technical Division,
agos.
Zard & Co. Ltd., Lagos.

Diesels — Industrial and Marine

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Apapa.
T. T. Briscoe (Nigeria) Ltd., Technical
Department, Apapa.
Holt Engineering Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria)
Ltd. Nigerian Motors Industries Ltd.,
Apapa.
Henry Stephens Engineering Co. Ltd.,
Ilupeju Industrial Estate.
Stockvis Nigeria Limited.
UTC Technical Division, Apapa.

Dispensing and Bulk Pumps

Wayne (West Africa) Ltd., Apapa.

Doors & Windows

Aluminium Manufacturing Company of
Nigeria Limited (Alumico), Apapa.
Briscoe Enterprises Ltd., Apapa.
Cottall Hope Nigeria Limited.

Dredging & Reclamation Contractors

Nigeria Dredging & General Works
Ltd., Apapa.
Westminster Dredging (Nig.) Ltd.,
Lagos.

Dumpers

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Ltd., Isolo.
Conveyancer (Nig.) Ltd., Apapa.
Leventis Motors Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria)
Ltd., Lagos.
Morpul Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd., Lagos.
Scastrac, Ikeja.
Structor Technique.
Tarpaulin Industries (WA) Ltd., Apapa.

Earthmoving Equipment

Afrotec Technical Services (Nigeria)
Ltd., Isolo.
Bewac Ltd., Apapa.
Blackwood Hodge (Nigeria) Ltd.,
Apapa.
Greenham Plant Hire (a Division of
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Holt Engineering Ltd., Apapa.
Conveyancer (Nigeria) Ltd., Apapa.
Haltam Cradlers, Leicester, UK.
Holman Brothers (Nigeria) Ltd.,
Apapa.
Joy Manufacturing Co., USA.
Leventis Motors Ltd., Lagos.
Nigerian Motors Industries Co. Ltd.,
Apapa.
Scastrac, Isolo.
Sironghold (Nigeria) Ltd., Engineering
Services Division, Ikeja.
Tractor & Equipment (a Division of
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Electrical Contracting Materials

Cutter Hammer Nigeria Ltd., Yaba.
Holt Engineering Ltd., Apapa.
Pan Electric, Apapa.

Electrical/Electronic Equipment

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R. T. Briscoe (Nigeria) Ltd., Technical
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Cutter Hammer Nigeria Ltd., Yaba.
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Events Technical Ltd., Lagos.
Metat Engineering Co. Ltd., Lagos.
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NITECO, Apapa.
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VYB (Nigeria) Ltd., Apapa.

Electrical Engineering Contractors

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Electric Cable & Overhead Conductor.
Ibemet Babu Electrical Co., Ikeja.
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Motat Engineering Co. Ltd., Lagos.
Technical Constructions (Nigeria) Ltd.,
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Electric Fans

Nigeria Engineering Works Ltd., Port
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Electrical Projects

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Electrolytic Capacitors

Daly (Condensers) Ltd., Dorset, UK.

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Fibreglass Stockists

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Nigerian Motors Industries Ltd.,
Apapa.

NITECO, Apapa.
Tractor & Equipment (a Division of
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Engineering Services Division, Ikeja.
Henry Stephens Engineering Co. Ltd.,
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Waateco Ltd., Iganmu.

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Crittall Hope Nigeria Ltd.
Steel Works Ltd., Ibadan.

Full and Split Charter Operations

Air Marketing International Group of
Cos., Crawley, UK.

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VYB (Nigeria) Ltd., Apapa.
Wayne (West Africa) Ltd., Apapa.
C. Zard (Co. Ltd.), Lagos.

Glasshouses

Makin Ltd., Ilupeju.

Glass/Mirrors Processors

Pilkington Glass (Nigeria) Ltd., Apapa.

Graders

Blackwood Hodge (Nigeria) Ltd.,
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Holt Engineering Ltd., Apapa.
Morpul Industrial Corp. Ltd., Apapa.
Nigerian Motors Industries Ltd.,
Apapa.

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Nirexim GmbH, Vienna.
Equipment Ltd., London.
F. Steiner & Co. Ltd., Lagos.

Insurance Brokers & Consultants

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Intruder Detection & Alarm Systems

Reiss & Co. (Nigeria) Ltd., Lagos.

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Guthrie (Nigeria) Ltd., Lagos.
Leventis Technical Ltd., Lagos.
Phoenix Motors Ltd., Lagos.
Stockvis Nigeria Limited.

Labeling Machines

Makin Ltd., Ilupeju.

Laboratory Chemicals/reagents

The Twilights Nigeria Ltd.

Laboratory Furniture

Nirexim GmbH, Vienna.

Laundry Equipment

F. Steiner & Co. Ltd., Lagos.
VYB (Nigeria) Ltd., Apapa.

Library Equipment

Nigeria Engineering Works Ltd., Port
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Stokvis Nigerian Tool & Die Co. Ltd.,
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C. Zard & Co. Ltd., Lagos.

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Bisulou Enterprises Ltd., Apapa.

Marine Engines and Accessories

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Blackwood Hodge (Nigeria) Ltd., Diesel
Sales and Service Division, Apapa.
R. T. Briscoe (Nigeria) Ltd., Lagos.
Holman Brothers (Nigeria) Ltd.,
Apapa.
Nigerian Motors Industries Ltd.,
Apapa.
Henry Stephens Engineering Co. Ltd.,
Apapa.

Mechanical and Electrical Engineering Contractors

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Fado Engineering Co. Ltd., Ebute-
Metta.
Haden Nigeria Ltd., Ilupeju.
Heplac Nigeria Ltd., Lagos.

Motor Transport (Trucks)

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R. T. Briscoe (Nigeria) Ltd., Motor
Division, Iganmu.
Henry Stephens Engineering Co. Ltd.,
Apapa.
Leventis Motors Ltd., Apapa.
NITECO, Apapa.
Phoenix Motors Ltd., EB, Lagos.
Waateco Ltd., Iganmu.

Office Equipment

GBO BEAM (a Division of UAC of
Nigeria) Ltd., Lagos.
Leventis Technical Ltd., Lagos.
Nigeria Engineering Works Ltd., Port
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F. Steiner & Co. Ltd., Lagos.

Office Metal Furniture

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Steel Works Ltd., Ibadan.

Oil Tank Calibrators

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Industrial Gases Ltd., Apapa.

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Ikeja.

Paints & Varnishes

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Bisulou Enterprises Ltd., Apapa.
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Makin Ltd., Ilupeju.
Nigerlux Paints, International Paints
(West Africa) Ltd., Ikeja.

Petroleum Hose

Wayne (West Africa) Ltd., Apapa.

Pipes, Building & Pressure

Bisulu Enterprises Ltd., Apapa.
Brossette (Nigeria) Ltd., Apapa.
Dunlop Nigerian Industries Ltd., Ikeja.
D. L. Payne (Nigeria) Ltd., Yaba.
Interplast Ltd., Accra.
Leventis Stores, Lagos.

Plant Hire

Costain (West Africa) Ltd., Lagos.
Greenham Plant Hire (a Division of UAC of Nigeria) Ltd., Ikeja.

Plastic Processing Equipment

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Poultry Feed Distribution Equipment

Makin Ltd., Ilupeju. Afrotec Technical Services (Nigeria) Ltd., Isole.

Printing Materials

Maken Smelting Co. Ltd., Jos.

Projected Windows

Steel Works Ltd., Ibadan.

Protective Coatings

Bostik Ltd., Leicester, UK.

Pumps

Afrotec Technical Services (Nigeria) Ltd., Isole.
R. T. Brossette (Nigeria) Ltd., Technical Department, Apapa.
Jos. Hansen & Soehne Nigeria Ltd., Apapa.
Henry Stephens Engineering Co. Ltd., Apapa.
Holman Brothers (Nigeria) Ltd., Apapa.
Leventis Technical Ltd., Lagos.
M. & E. (a Division of UAC of Nigeria) Ltd., Lagos.
NITECO, Apapa.
Phoenix Motors Ltd., Lagos.
Stockvis Nigeria Limited.
Tarpaulin Industries (WA) Ltd., Apapa.
UTC Technical Division, Apapa.
VYB (Nigeria) Ltd., Apapa.
Waareco Ltd., Technical Division, Lagos.

Quarry Plant

Afrotec Technical Services (Nigeria) Ltd., Oshodi.
Blackwood Hodge (Nigeria) Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd., Lagos.
Tarpaulin Industries (WA) Ltd., Apapa.

Radio Communication Equipment

R. T. Brossette (Nigeria) Ltd., Telecommunications Dept., Apapa.
J. Allen & Company Ltd., Apapa.
Communications Associates of Nigeria Ltd., Ikeja.
Mofat Engineering Co. Ltd., Lagos.
Philips (Nigeria) Ltd., Lagos.
Plessey (Nigeria) Ltd., Lagos.

Radio Distributors

Leventis Technical Ltd., Lagos.
Pan Electric (a Division of UAC of Nigeria) Ltd., Ebute-Metta.

Road Making Equipment

Blackwood Hodge (Nigeria) Ltd., Apapa.
Joy Manufacturing Co., USA.
Leventis Motors Ltd., Apapa.
M. & E. (a Division of UAC of Nigeria) Ltd., Lagos.
Morpel Industrial Corp. Ltd., Apapa.
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Ropes

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Shipping and Forwarding Agents

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Soil Investigation

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Solders

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Alhaji M. R. Shitta & Sons Ltd., 41 Ojunsika Street, Shomolu, Lagos. Tel. 44191.
All Countries Business Agency, West House, Slough Lane, Sanderton, Nr. High Wycombe, Bucks., UK. Tel. 024024 3701. Telex 837660.
J. Allen & Company Ltd., P.O. Box 542, 25 Creek Road, Apapa. Tel. 47881.
Allens Marine, J. Allen & Co. Ltd., 9/10 Yakubu Gowon Drive, P.O. Box 282, Port Harcourt, Rivers State, Nigeria.
Alumaco Aluminium Manufacturing Company of Nigeria Limited, 25 Burma Road, P.O. Box 60, Apapa. Tel. 44664 5, 44686.
Aluminium Manufacturing Company of Nigeria Limited (Alumaco), 32 Creek Road, P.O. Box 60, Apapa. Tel. 44664 5, 44686.
Aluminium Wire and Cable Co. Ltd., Port Tennant, Swansea, Glamorgan, UK.
Bennett Babs Electrical Co., P.O. Box 444, Ikeja, Lagos.
Berger Paints Nigeria Ltd., Okra Abaku Ave., PMB 1052, Ikeja.
Bewac Limited, 1 Commercial Road, PMB 1016, Apapa. Tel. 45055, 41193.
Bisulu Enterprises Ltd., 1 Warehouse Road, Apapa, P.O. Box 3214, Lagos. Tel. 47288, Telex BAEKBEK 21543N.
Blackwood Hodge (Nigeria) Ltd., 15 Burma Road, P.O. Box 109, Apapa. Tel. 47107, 47049.
Bostik Ltd., Ulverscroft Road, Leicester LE18 6BW. Tel. Leicester 50015. Telex 34625.

R. T. Brossette (Nigeria) Ltd., Agricultural Estate, Technical Dept., Apapa.
Motor Division (Nigeria) Ltd., Telecommunications Dept., Apapa.
Brossette (Nigeria) Ltd., 311 Apapa Road, Lagos.
Calabar Cement Co. Ltd., P.O. Box 218, Calabar.
Caleb Burne & Son, P.O. Box 24, 34 NPA Commercial Wharf Road, P.O. Box 45458, 47015.
Chedara's Building Department, 19 Wharf Road, Apapa.
Controls and Automation, 270 Herbert Macaulay Road, Lagos. Tel. 4190.
Consynanper (Nigeria) Ltd., Plot 12, Igamu, Apapa. Tel. 47025.
Communications Associates of Nigeria Limited, Industrial Crescent, Estate, PMB 1126, Lagos. Tel. 32207 & 32208.
Costain (West Africa) Ltd., 174 Western Avenue, Lagos. Tel. 4374 58.
Crinital Hope Nigeria Limited, Agege Motor Road, Lagos. Tel. 41408.
Cutter-Hammer Nigeria Ltd., 5 Eleruwa Street, Ibeju-Lekki, Lagos. P.O. Box 490, Ibeju-Lekki.
Daily (Condensers) Ltd., Granley Works, Granley, Lagos. Westmouth, Dorset DT4 9JG. 030 57 2871. Telex 4174.
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W. A. Dizonoff (Nigeria) Ltd., 23 Creek Road, P.O. Box 340, Lagos. Tel. 42080, 42089.
Drake & South (Nigeria) Ltd., P.O. Box 2949, 90 Lewis St., Lagos. Tel. 27289. Telex 20289.
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Dunlop Nigerian Industries Ltd., Oba Akran Avenue, PMB 1070, Lagos. Tel. 3185.
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7419, Lagos. Tel. 40738.
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567. 2406. Telex 21413.
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Man Brothers (Nigeria) Ltd.,
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Tel. 450078.
John Engineering,
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Tel. 458012.
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23 Murata Muhammad Way, Kano.
Industrial Gates Ltd.,
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Tel. 429414.
Oshodi Industrial Estate, State
Highway, Ibeju. Tel. 32497.
M'Dermott Road, P.O. Box 23, Warri.
Tel. 378.
49 Ibeju Bye pass, Oke Ado Road, PM
Box 5327, Ibadan. Tel. 23201.
3 Kacha Road, P.O. Box 144, Kaduna.
Tel. 41353.
13 Sakopa Road, Binnu City.
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Terbok, Lagos.
Interplast Ltd.,
P.O. Box 1060, Accra. Tel. 21771.
Telex 2088. Cable: Interplast.
James Kilpatrick (Nig.) Ltd.,
P.O. Box 2946, Lagos. Tel. 47505,
47511 & 45983. Telex 21420.
Joy Manufacturing Co.,
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15222, USA. Tel. 412 562 4593. Telex.
36 6558.
Landmark Industrial Supplies Limited,
39 & 50 Ibadan Street (We4), Ebute
Metta.
Lemish Motors Ltd.,
Apapa Road, P.O. Box 390, Apapa,
Lagos. Tel. 45231/6.
Lemish Stores Ltd.,
Manna, Lagos.
Lemish Technical Ltd.,
P.O. Box 159, Idko House, Idko Island,
Lagos. Tel. 41311.
**Machinery & Electrical Equipment
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1 Taylor Road, Iddo, PMB 1015,
Ebute Metta, Lagos. Tel. Lagos 43310.
Makon Smelting Co. Ltd.,
P.O. Box 653, Jos. Tel. 2841. Telex
M114 Ng.
Makin Ltd.,
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**Mandair Limited, Air Conditioning
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45942.
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Industrial Estate, Ikeja. Tel. 33895/6.
**Nirexim Handelsgesellschaft GmbH &
C. KG.**,
Dorotheergasse, 6/11, a-1010 Vienna,
Austria. Tel. (222) 520737. Telex
11918. Cables: Nirexim.
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Pan Electric,
Seaplane Road, P.O. Box 345, Apapa.
Tel. 42485.
Paterson Zochonis & Co. Ltd.,
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223, 239.
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Westminster Dredging (Nigeria) Ltd.,
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