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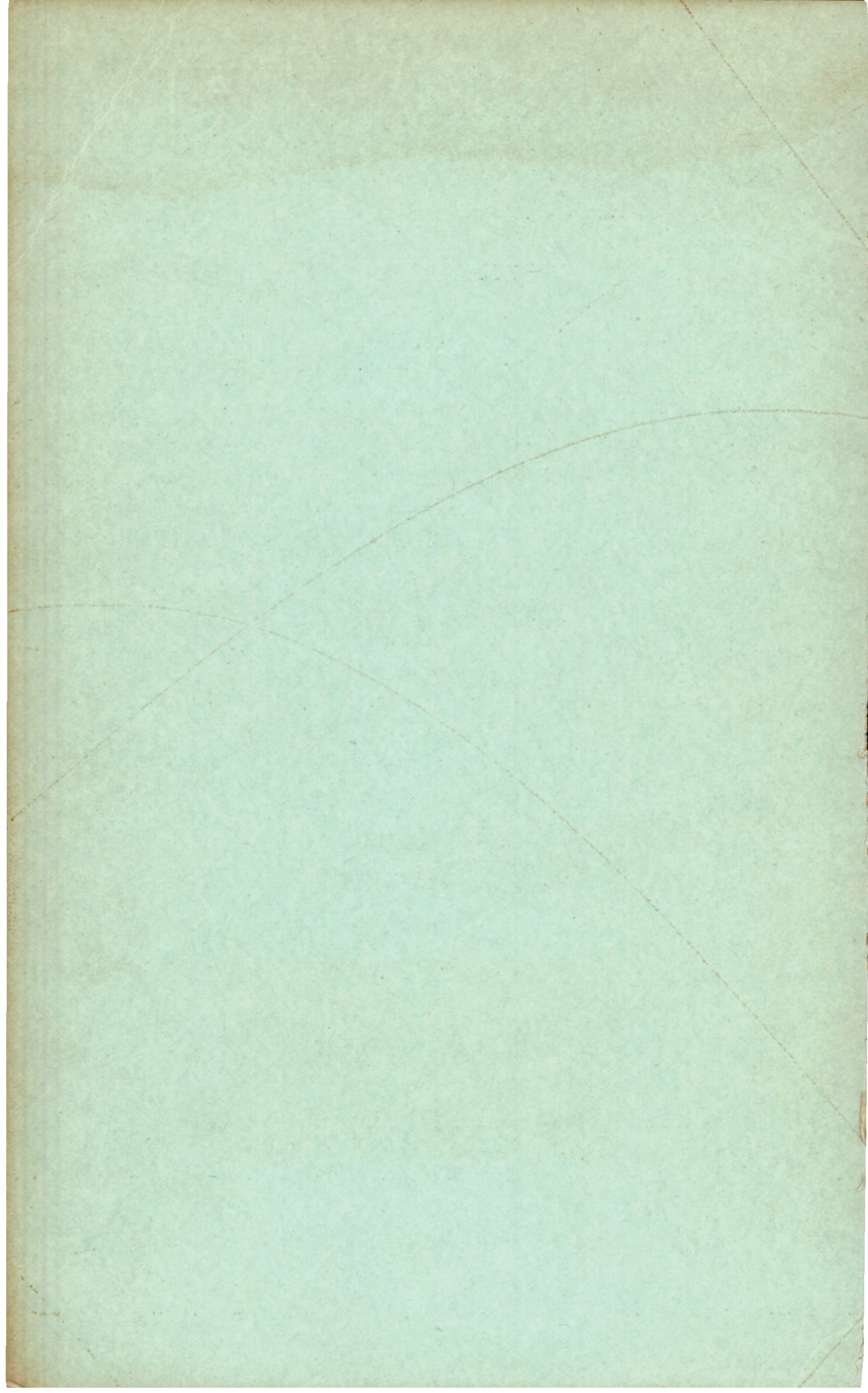
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**MINES AND GEOLOGICAL  
DEPARTMENT  
ANNUAL REPORT  
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**MINES AND GEOLOGICAL  
DEPARTMENT  
ANNUAL REPORT  
1969**

**KENYA NATIONAL ASSEMBLY**

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# **MINES AND GEOLOGICAL DEPARTMENT**

## **ANNUAL REPORT 1969**

### **I—INTRODUCTION**

During 1969 the department continued mineral survey programmes including regional and selected geochemical surveys and the investigation of mineral deposits by sampling, mapping and diamond drilling and also provided advisory and laboratory services to individuals and companies engaged in prospecting and mining.

Registered mining claims numbered 851 at the end of the year, by comparison with 629 at the end of 1968. Thirteen major exploration licences were current covering a total area of 44,147 square miles

Private expenditure on exploration and development amounted to K£1,792,846, showing a slight increase on the previous year (K£1,722,845). Revenue derived from mining fees and royalties were approximately double those received during the previous financial year.

Development drilling on a lead/silver deposit in Coast Province was nearing completion at the end of the year and probable ore reserves of approximately one million tons at a grade of 9 per cent lead and 4 oz. silver per ton had been established. Development of the Mrima Hill niobium/europium deposit also in Coast Province was making good progress, and the search for radioactive minerals was extended into western and coastal Kenya with the grant of further exploration licences to the operating company. Oil exploration continued in the Lamu area, with an expenditure during the year of over K£ one million. Deep test drilling is planned for 1970.

The total value of mineral production at K£2,821,449 showed a slight decline on the 1968 figure (K£3,154,680). A considerable increase in the total value of mineral production can be expected in the early seventies from sales of fluorite, lead, silver, and rare-earth minerals now under preliminary mining development.

## II—DEPARTMENTAL WORK

### (1) Geological and Mineral Surveys

By the end of 1969 some 430,400 square kilometres (166,200 square miles), approximately 78 per cent of the total land area of Kenya, had been geologically mapped, and 83 geological reports, with coloured maps mostly at a scale of 1:125,000 had been published. An index plan showing the areas mapped and reports published, is at the end of this report.

The only regional mapping accomplished during 1969 was done in the central and northern Rift Valley by the East African Geological Research Unit, composed of post-graduate students of Bedford College, University of London. This group works as a self-contained unit in close collaboration with the Mines and Geological Department.

The department's own geological staff again concentrated their efforts on the evaluation of mineral occurrences. The main areas of activity were in Nyanza and Western provinces, mainly on gold prospecting as part of the joint Kenya Government-United Nations Development Programme Mineral Survey; in the western part of Rift Valley Province, on a geochemical survey for base metals (again in conjunction with U.N.D.P.); in Coast Province on exploration and proving of lead/zinc/silver deposits.

Work on gold areas in western Kenya mainly comprised surface sampling of vein outcrops, with a small amount of shallow diamond drilling, using a portable rig. In the western part of Rift Valley Province a programme of soil and sediment sampling was carried out in the area of the Cherangani Hills and Elgeyo Escarpment in a search for base metals, chiefly copper, lead/zinc and nickel, all of which are known to occur there, with the object of delineating areas which would repay intensive prospecting for economic deposits.

In Coast Province intensive diamond drilling continued with three rigs on the Kinagoni Hill lead/silver prospect, and at the year's end a report was completed for submission to mining companies interested in developing the substantial tonnage of good grade ore proved by the department's work over the past few years. Boreholes completed in 1969 numbered 20, with a total footage of 8,466 feet. Of this total three boreholes (1,297 feet) were drilled by a contracting company, the remainder by the department's own drilling teams. The average depth per hole was 423 feet, the deepest bottoming at 595 feet. Assays for lead, silver and zinc were made on each of 998 core samples from these holes.

For the last three months of the year two geologists were engaged on geochemical prospecting to determine the westward extension of lead/zinc/silver mineralization in Coast Province.

Other mineral investigations carried out by the department during the year included investigations of clays in Nyeri and Kajiado districts; fluorite in Elgeyo-Marakwet and Baringo districts; sapphire in Machakos district; chromite and nickel in West Pokot; corundum in Embu, Meru and North Kitui districts; calcite and wollastonite in Kajiado district. In addition geologists gave assistance on stratigraphical problems to an archaeologist working in Nakuru District; examined and advised on building foundations in Nairobi; examined roads at Homa Bay which were thought to be threatened by volcanic activity following earth tremors. This latter was found to be due to soil swelling, not to volcanism.

In October the joint Kenya Government-United Nations Development Programme Mineral Survey in Western Kenya came to an end, and a final report on the second phase of the project was forwarded to U.N. headquarters in New

York. By the end of the year U.N. headquarters had still not formally submitted to Kenya Government the final report on the first phase, which was written in May 1968.

#### HEADQUARTERS WORK

Progress in the publication of geological reports and maps was as follows:—

Reports printed	..	..	..	..	..	..	2
Bulletins, etc. printed	..	..	..	..	..	..	2
Maps printed	..	..	..	..	..	..	4
Proofs corrected (Publications)	..	..	..	..	..	..	5
Proofs corrected (maps)	..	..	..	..	..	..	3
Reports edited	..	..	..	..	..	..	5

On 1st January, 1970 two regional reports and one bulletin were being typeset by the Government Printer, Nairobi, and three coloured geological maps were in the hands of a London printer. Reports awaiting publication (excluding those mentioned above) now amount to 16.

Work was continued on the preparation of a new geological map of Kenya at a scale of 1:1,000,000 and at the year's end this was nearing completion.

Two instructional courses for prospectors, each of one week's duration, were given during the year, and were attended by 39 members of the public holding or wishing to obtain a Prospecting Right.

Several senior officers gave a total of 14 lectures to members of other Government departments, learned societies, schools and social groups during the year on widely varying subjects such as Mining Law, explosives, gem-stones, the Rift Valley and general geology. Five parties of students from local colleges and schools were given conducted tours of the departmental museum and the various laboratories during the year.

In July Dr. M. C. G. Clarke represented the department at a mineral exploration and development conference held in Entebbe to mark the 50th anniversary of the Uganda Geological Survey.

In August the Mines and Geological Department joined the Forest Department and National Parks of Kenya in mounting a display at the Mombasa Show, which had the distinction of being visited by His Excellency the President, and of winning an award by the show committee. The department's indoor contribution was an exhibit (mounted in conjunction with B.P.-Shell Petroleum Development Company of Kenya Ltd.) showing the progress of oil exploration in Kenya. Outside the show building one of the department's diamond drills gave a working demonstration and produced a continuous core of rock down to 200 feet below the visitor's feet.

The department again mounted an exhibit as part of the Ministry of Natural Resources' display at the Nairobi Show at the end of September. The exhibit demonstrated the development of a typical mine from the prospecting stage to production, showing how the department can be of assistance at all stages of development. Of almost as great an interest to the public was a striking show of gemstones and ornamental rocks, all made in Kenya from local raw material.

#### DETERMINATIVE WORK

Apart from samples submitted for assay, enumerated elsewhere, a total of 3,543 specimens were identified for members of the public and other Government departments. This figure is higher than the 1968 total by some 35 per cent, the increase being largely due to the growing interest shown by prospectors in precious

and semi-precious gemstones. The minerals most often submitted were, in order of frequency, garnet, quartz and allied silicate minerals, tourmaline, beryl and aquamarine, gem corundum, commercial grade corundum, kyanite and feldspar. A rather unusual submission was a handful of pieces of rock sugar, which a prospector tried hard to convince the examining geologist had been dug from the ground, and that he had discovered a potential sugar-mine.

#### LAPIDARY WORK AND MUSEUM

A total of 244 thin sections of rocks and minerals were prepared, of which 37 were made for members of the public.

Additions to the museum and rock collection comprised:—

General collection .. .. .	81
Regional collection .. .. .	33
Mineral collection .. .. .	43

#### DRAWING OFFICE

Until October two separate drawing offices were maintained, one being closed down on the completion of the U.N. project. The draughtsman in charge of that office, Mr. M. S. Kambo, was then regretfully retired under the Kenyanization of personnel policy, after eight years of excellent service. Mr. L. C. Sanhotra left the department on termination of his contract. Mr. R. G. Kibunyi was appointed Assistant Draughtsman on successful completion of training within the department and Mr. Mutuni was appointed Draughtsman on transfer from the Survey of Kenya. Present staff comprises one Senior Draughtsman, two Draughtsmen and one Assistant Draughtsman.

Work accomplished during 1969 was as follows:—

Geological maps for publication .. .. .	3
Text figures for publication .. .. .	95
Ammonia prints .. .. .	835
Photo prints .. .. .	167
Photo negatives .. .. .	94

#### LIBRARY

Accessions to the departmental library totalled 2,562, comprising:—

East Africa Section .. .. .	127
General Africa Section .. .. .	44
General Section .. .. .	1,691
Journals .. .. .	700

The figure is almost 50 per cent higher than the total accessions in 1968 (1,737) and reflects the expanding volume of technical information published over the past decade. The department's librarian is to be commended in that he handled such a growing volume of work (all relevant items are cross-indexed, often under some seven or eight heads) virtually single-handed.

The sale of departmental publications again showed a marked increase, receipts totalling £1,250 as against £900 in 1968. This figure includes sales of the same publications made by the Government Printer.

#### VISITORS

Visitors to the department in 1969 numbered 3,013, an increase of 756 over the number of visitors in 1968, and almost double the number seen in 1967. Most of these visitors were seeking advice on prospecting or mining, or required geological information from officers of the department or from the library.



The department was pleased to welcome no fewer than seven former officers who had left Kenya, but were paying brief holiday visits to the country. These were Mr. E. C. Cowley-Lamb, now living in Norway; Dr. R. G. Dodson, Darwin, Australia; Dr. C. G. B. DuBois, Camborne, England; Mr. C. A. Harvey, Malta; Mr. M. Mloszewski, Canada; Dr. E. P. Saggerson, Durban; Dr. D. L. Searle, Zambia.

Among visitors from overseas were Dr. J. Agard, B. R. G. M. Orleans, France; Mr. H. A. Ballin, Firestone Ltd; Mr. D. J. Batzer, Kuala Lumpur; Miss K. Behrensmeyer, Harvard University; Dr. W. W. Bishop, University of London; Mr. W. P. Blair, Los Angeles; Mr. T. den Bruik, Geological Survey, Sweden; Dr. K. Butzer, University of Chicago; Dr. R. T. Cannon, Geological Survey, Malawi; Prof. B. Collini, University of Uppsala; Mr. G. R. Cutts, Scandura Ltd; Dr. B. Dawson, University of St. Andrews; Dr. P. D. Denman, Geological Survey, Zambia; Dr. A. T. J. Dollar, University of London; Dr. E. Frankel, Royal Dutch Shell, Holland; Mr. E. Ghosn, Beirut; Dr. R. Glen, Commonwealth Scientific Committee, London; Mr. L. L. Gordon, New York; Dr. J. B. Gustavson, Palo Alto, California, U.S.A.; Mr. T. Haile, Geological Survey, Addis Ababa; Mr. I. M. Hewitt, Scandura Ltd; Mr. T. Horvath, Hungarian Embassy; Dr. Glynn Isaac, Berkeley, California; Dr. D. Johnstone, B. P., London; Prof. A. P. Kapitsa, Prof. V. V. Belousov and nine other scientists of U.S.S.R. Academy of Sciences; Prof. B. C. King, University of London; Mr. Soulé De Lafont, Paris; Mr. S. Lawn, Union Carbide, London; Dr. P. F. Lonsdale, Trinity College, Cambridge; Mr. K. Kobayashi, Nissho-Iwai Co. Ltd., Japan; Mr. D. Mannucci, C. F. D. Milan; Mr. A. MacLeod, University College of North Wales; Dr. D. Malone, B.P., London; Dr. J. A. Miller, Cambridge University; Messrs. T. Noguchi, M. Kitami, K. Kuroda, A. Takahashi and S. Toya, Japan Newer Metals Mission; Dr. J. Perry, B.P., London; Dr. J. D. A. Piper, University of Leeds; Mr. P. H. Paris, Geologist (Director) Adobe International Inc; Dr. F. W. Price, Addis Ababa; Dr. R. C. Rainey, D.I.C., London; Mr. R. B. Ridgeway, D.O.S., London; Dr. L. Robbins, Michigan State University; Mr. K. Sawada, Nissho-Iwai Co. Ltd., Japan; Mr. N. Singer, Denver, Colorado, U.S.A.; Dr. J. Sponemann, University of Gottingen; Mr. E. Suzuki, Nissho-Iwai Co. Ltd., Japan; Messrs. H. Takahashi, A. Yokota, S. Tono and T. Kato, Mineral Resources Centre, Tokyo; Mr. C. M. Taylor, Sausalito, California; Prof. H. Tazieff, Paris; Dr. H. Teitz and Mr. J. Blankenship Houston, Texas; Dr. T. P. Thayer, U.S. Geological Survey, Washington; Mr. R. F. Thyer, B.C.G.L.O., London; Mr. E. Tohar, Geological Survey, Israel; Mr. H. H. Williams, Huntings Ltd., London; Mr. Zushi, Nissho Co., Japan.

## PUBLICATIONS

The following Departmental publications were published in 1969:—

Mines and Geological Department Annual Report for 1967.

The Geology and Mineral Resources of Kenya by W. Pulfrey—second revision by J. Walsh. (Bulletin 9).

Rocks and Soils, by B. G. Stone (Pamphlet for schools).

Geology of Northern Turkana, by J. Walsh and R. G. Dodson (Report No. 82)

Geology of the Eldama Ravine-Kabarnet area by J. Walsh (Report No. 83).

The following papers on East African geology were published by serving and past members of the department:—

“Mineral and Thermal Waters of Kenya”, by J. Walsh, *Proc. xxiii Int. Geol. Congr.* Vol. 19 (1969) pp. 105-110.

- “Current Geological and Geophysical Research on the Rift Valley of East Africa”, by B. H. Baker. *Bull. Field Sci. Afr.* Vol. 4 (1969) pp. 69-74.
- “Structural Evolution of the Rift Zone of the Middle East”, by B. H. Baker. *Nature, Lond.* Vol. 224 (1969) pp. 359-360.
- “Prospects of Mineral Development in Kenya”, by J. R. Lee. *Asili* No. 1 (1969) pp. 27-28.
- “The Mrima Hill Niobium and Rare Earth Deposit”, by J. E. Mason. *Asili* No. 2 (1969) p. 11.
- “Beryl”, by J. E. Mason. *Asili* No. 3 (1969) pp. 13-14.
- “A simple Alkalinity Ratio and its Application to Questions of Non-orogenic Granite Gneiss”, by J. B. Wright. *Geol. Mag.* Vol. 106 (1969) pp. 370-384.
- “Volcanic Associations in the Gregory Rift Valley, East Africa”, by L. A. J. Williams. *Nature, Lond.* Vol. 224 (1969) pp. 61-64.
- “Diamond Drilling”, by J. Walsh. *Asili* No. 4 (1969) pp. 27-28.

#### REPORTS

Reports for departmental use were prepared on the following subjects:—

- The Telot chrome/nickel deposit, West Pokot. (J.E.M.-R/14/01).
- Interim evaluation of the Kinagoni Hill lead prospect, Kilifi District, Coast Province (J.E.M.-R/27/02).
- Swamp clays at Kariuro, Nyeri District. (J.E.M.-R/15/03/11).
- Fluorite occurrences on Naon Hill near Musgut, Elgeyo-Marakwet District. (J.E.M.-R/21/02).
- The Tseikuru corundum deposits (B.G.S.-R/02/02).
- The Fluorite deposits of Musgut. (B.G.S.-R/21/02).
- Report of gold survey, Ngiga. (W.O.-G/1/6/03).
- The Kinagoni Hill lead-silver prospect (M.C.G.C.-SPL/52).
- Galena/barytes occurrence at Mwereni, Kwale District. (M.C.G.C.-R./27/02/III).
- Report on the geology and mineral resources around Changombe (T.P.R.-R/27/02/III).

#### (2) Mining Inspectorate

##### SAFETY INSPECTIONS OF MINES AND QUARRIES

The Inspectors of Mines continued to make regular inspections of mines and to assist the Inspectors of Explosives in carrying out similar duties in building stone and ballast quarries throughout Kenya. Assistance in the administration of the Mining Regulations was given by the Warden of Mines (Trainee). Mr. D. Riva left on completion of his tour of service.

A total of 202 inspections and 17 repeat inspections was carried out during the year. The chief defects detected and brought to the notice of the management were as follows:—

Inadequate supervision	..	..	..	..	..	43
Dangerous ground	..	..	..	..	..	13
Dangerous blasting practice	..	..	..	..	..	4
Dangerous machinery	..	..	..	..	..	16
Other minor contraventions	..	..	..	..	..	57

Summary fines totalling Sh. 10,000 were imposed on managers or owners of quarries for breaches of Mining (Safety) Regulations.

The Inspectors lectured periodically at the C.I.D. Training School on minerals and the legal requirements of the various Acts administered by the department. Courses were held for members of the public interested in prospecting to enable them to qualify for the issue of a Prospecting Right. These courses included instruction in simple surveying techniques, elementary geology and mineralogy, prospecting methods and explanation of the Mining Act to assist them in understanding and applying the legal requirements of the Act.

### MINING ACCIDENTS

Thirteen accidents were reported during the year, resulting in injuries to 14 persons and one fatality caused by flying debris from a blast.

The following is an analysis of the accidents reported and investigated by members of the inspectorate:—

CAUSE OF ACCIDENT	ON SURFACE		UNDERGROUND	
	Killed	Injured	Killed	Injured
Fall of Rock .. ..	Nil	Nil	Nil	6
Mechanical .. ..	Nil	1	Nil	1
Electrical .. ..	Nil	Nil	Nil	Nil
Shafts .. ..	Nil	Nil	Nil	Nil
Raises .. ..	Nil	Nil	Nil	Nil
Explosives .. ..	1	5	Nil	Nil
Miscellaneous .. ..	Nil	Nil	Nil	1
<b>TOTALS .. ..</b>	<b>1</b>	<b>6</b>	<b>Nil</b>	<b>8</b>

### (3) Explosive Inspectorate

Mr. C. Y. Ochieng-Owayo, Inspector of Explosives left for further technical training overseas in September leading to qualifications in mining engineering. Mr. G. C. Ngahu, Inspector of Explosives (Trainee) was promoted to Inspector during the year on passing the appropriate departmental examination.

Assistance was given to the C.I.D. Training School, by providing lecturers at regular intervals during the year, on the laws relating to explosives.

In addition 310 inspections of magazines, quarries, and other projects such as road building were inspected, as also were ships carrying explosives on arrival in Kilindini, prior to discharge.

Fireworks importers' and dealers' premises were inspected in conjunction with the Nairobi and Mombasa Firemasters. 48 cases of fireworks imported in contravention of Explosives (Fireworks) Rules were confiscated and later destroyed.

In the course of carrying out these inspections a total of 13,108 miles was covered in Government vehicles.

The following table summarizes the issue of permits and licences in connexion with the import, re-export, transport, manufacture, storage and use of explosives. Statistics relating to quantities of blasting explosives and accessories imported, re-exported and sold in Kenya by dealers are given in Appendix I.

Permits or Licences Issued	Blasting Explosives	Fireworks
Importer's Licence .. ..	N/A	9
Import Permits .. ..	21	35
Export Permits .. ..	244	5
Purchase Permits .. ..	2,637	N/A
Transport Permits .. ..	488	N/A
Magazine (+1,000 lb.) Licences	35	N/A
Magazine (-1,000 lb.) Licences	176	N/A
Temporary Storage Permits ..	1	N/A
Dealer's Licence .. ..	4	119
Permits to use Explosives ..	237	N/A
Permits to Manufacture Explosives .. ..	3	Nil

The tabulation below is an analysis of the number of high explosives magazine licences issued during the year.

Province	Capacity	Number of Magazines	Total Capacity High Explosives (50 lb. units)
Western .. ..	+1,000 lb.	Nil	Nil
	-1,000 lb.	4	17
Nyanza .. ..	+1,000 lb.	9	6,504
	-1,000 lb.	12	59
Central .. ..	+1,000 lb.	3	250
	-1,000 lb.	23	139
Rift Valley .. ..	+1,000 lb.	6	1,930
	-1,000 lb.	18	139
Eastern .. ..	+1,000 lb.	6	2,064
	-1,000 lb.	8	59
Coast .. ..	+1,000 lb.	17	2,295
	-1,000 lb.	14	132
North-Eastern .. ..	+1,000 lb.	Nil	Nil
	-1,000 lb.	Nil	Nil

Permits to use blasting material issued .. ..	232
Renewals .. ..	217
New issue .. ..	15
Tests taken .. ..	31
Tests failed .. ..	13

In the course of inspections the following explosives and accessories were confiscated and destroyed:—

Gelignite .. ..	101½ lb. 63 sticks
Cordtex .. ..	3 feet
Detonators .. ..	50

#### (4) Laboratories

##### CHEMICAL LABORATORY

In September the department was able to recruit a fully qualified Chemist/ Assayer to fill the post which had been vacant for nearly five years. In early December the Assistant Chemist, who had borne the brunt of the work for that

period, began a well-earned vacation leave. However, with the running down and final completion of the Kenya Government-U.N.D.P. mineral survey the amount of work submitted was rather less than in the previous year, analyses made being as follows:—

Gold and silver ores .. .. .	949
Police (precious metal) .. .. .	1
Aluminium .. .. .	14
Beryllium .. .. .	1
Calcium .. .. .	9
Copper .. .. .	26
Iron .. .. .	3
Lead .. .. .	47
Magnesium .. .. .	10
Manganese .. .. .	1
Niobium/Tantalum .. .. .	1
Tin .. .. .	1
Uranium .. .. .	1
Zinc .. .. .	2
Miscellaneous .. .. .	7
TOTAL ..	<u>1,073</u>

#### MINERAL PROCESSING LABORATORY

On 1st May a mineral dressing expert, seconded to Kenya Government by U.K. Technical Aid, took over supervision of the laboratory.

Rewiring of the power supplies to machinery in the pilot plant was completed by the end of July, but connexion of the increased water supply necessary for the new equipment is not due for completion before March 1970.

On the mineral processing side a good deal of work was done on ores from the Kinagoni Hill (Coast Province) lead/silver deposit. This work mainly involved beneficiation tests by gravity methods, and some further work was done on separation of the oxidized ores by flotation methods. Flotation work was also done on the preparation of a metallurgical grade fluorite concentrate. Other laboratory work involved beneficiation studies on corundum, wollastonite and pumice.

On the plant operational side advisory work was done with commercial firms on dry grinding and classification of finely ground calcite and feldspar for the ceramics industry. The problems involved necessitated co-operation with industrial and research bodies overseas.

In conjunction with the Kenya Government-U.N.D.P. Mineral Survey, gold amalgamations and small plant designs were carried out.

#### GEOCHEMICAL LABORATORY

Metal tests carried out in 1969, totalling 55,892, were more than 55 per cent in excess of the 1968 figure of 35,042 tests. Elements determined were:—

Chromium .. .. .	9,492
Copper .. .. .	15,296
Lead .. .. .	6,390
Nickel .. .. .	9,492
Zinc .. .. .	15,222
TOTAL ..	<u>55,892</u>

### (5) Staff Changes and Departmental Training

Dr. L. D. Sanders, Commissioner of Mines and Geology, started vacation leave in October, being due back on duty in February 1970. Mr. F. W. A. Timms, Assistant Commissioner (Mines) took vacation leave from February to June and acted as Commissioner from October until the end of the year. Dr. J. Walsh, Chief Geologist, was on vacation leave from May to July. Mr. G. A. Tait acted as Assistant Commissioner in Mr. Timms' absence, and Mr. S. A. Dodha was Acting Chief Geologist during Dr. Walsh's leave. Mr. R. C. Patel, Laboratory Technologist, and Mr. N. P. Dosaj, Librarian, both began long leave in December.

Dr. J. E. Mason, U.K. Technical Aid, Geologist/Mineral Economist left in May after four years with the department. Two Canadian Technical Aid experts, Mr. L. Kaye, Geologist, and Mr. C. Berkhold, Driller, left Kenya in February and June respectively, each after two years' secondment. Mr. J. C. Patel, Prospector, and Mr. J. H. Stone, Executive Officer, were both retired during 1969, the latter after 12 years' service with the department.

The following new appointments were made; Mr. D. Robinson, Chemist/ Assayer; Mr. T. J. Hickey, Mineral Processing Adviser (on secondment from Warren Spring Laboratory, under U.K. Technical Aid); Mr. A. M. Ngumi, Geologist (supernumerary); Mr. K. S. Pandit, Geologist; Mr. B. N. Muhea, Executive Officer. Mr. J. K. Wachira, Trainee Geologist, was appointed Geologist in June after obtaining his B.Sc. degree from University College, Nairobi and Mr. G. C. Ngahu was appointed Inspector of Explosives in July after successful completion of training within the department.

Messrs. J. W. Wairegi and R. A. Okello, Geologists, continued their studies for higher degrees at the University of Leicester, under U.K. Government bursaries, and Mr. C. Y. Ochieng-Owayo, Inspector of Explosives, began a three-year course at Camborne School of Mines, England, also under a U.K. bursary. Mr. G. Ongweny, Trainee Geologist, continued his degree course at University College, Nairobi.

## III—THE MINING INDUSTRY

### (1) Gold

The Migori Mine of Migori-Nyanza Mines Ltd., which was the only significant producer, closed during the latter half of the year, reserves being exhausted.

Total output during the year from this source amounted to 55,847 gm. valued at K£273,821. Royalty payable to the Government under the Mining (Gold Royalty) (Migori Mine) Regulations was Sh. 136,916/30.

### (2) Copper

Leaching operations by water circulation in the upper levels of the Macalder Mine, operated by Migori Nyanza Mines Ltd., produced 77 tonnes of copper valued at K£40,444.

The Kenya Mining Company produced a small amount of copper from mining locations in the Elgeyo-Marakwet District of Rift Valley Province. This company has been investigating the possibilities of smelting their copper ores after leaching to produce a comparatively high grade "cement" copper and by the end of the year had reported some success.

### (3) Other Minerals

*Aquamarine.*—Production by small-scale workers continued during the year but was erratic and resulted in a total production amounting to only approximately 50 per cent of that for the previous year.

*Barytes*.—Production from Kilifi District amounted to 435 tonnes which was used locally for paint manufacture, as were 21 tonnes produced from Baringo District.

*Beryl*.—Beryl production was considerably lower than in 1968 and no new operators appeared in this field.

*Diatomite*.—African Diatomite Industries Ltd. produced 2,143 tonnes from the Gilgil area of Nakuru District and, during the latter part of the year, O. Gichure produced 160 tonnes from mining claims covering the Gicheru Deposit in Kiambu District.

*Felspar*.—John Heffer (Mining) Ltd., M. Gonella and Co. Ltd., and Mineral Mining Corporation (1965) Ltd., together produced a total of 1,560 tonnes from Machakos District which was used locally in the manufacture of scouring powders.

*Galena*.—Messrs. Mineral Mining Corp'n. (1965) Ltd. produced 6 tonnes from Kilifi District as a by-product during recovery of barytes, and the Kenya Mining Company exported 5 tonnes produced from Elgeyo-Marakwet District.

*Garnet*.—L. D. Gordon produced 113 kg. from Kajiado District.

*Gypsum*.—Operations in Kilifi and Kajiado Districts resulted in production of 61,845 tonnes, most of which was sold to the cement companies, the remainder being used in local manufacture, while a small amount was exported to Uganda.

*Guano*.—Production continued at Ithundu in Machakos District, amounting to 310 tonnes. Rayetta Estate Ltd. continued investigations in Coast Province, producing 50 tonnes used mainly in experimental investigations.

*Kaolin*.—The main source continued to be Eburru in Nakuru District.

*Limestone Products*.—Homa Lime Ltd. continued as the major producer of agricultural lime from Koru. A variety of products was marketed by Kenya Marble Quarries Ltd. and Limesales Ltd. operating in Kajiado District, and by Manak Lime Ltd. in Taita-Taveta District. M. Gonella and Co. Ltd. produced whiting as a by-product from wollastonite mined in Kajiado District.

*Magnesite*.—Markham and Co. Ltd. produced 503 tonnes from Kinyiki Hill in Machakos District for sale locally.

*Sapphire Corundum*.—Markham and Co. Ltd. at Kinyiki Hill in Machakos District and Continental Ore (Kenya) Ltd. in Kitui District produced 2,839 gm.

*Silver*.—Migori-Nyanza Mines Ltd. produced 51,880 gm. as a by-product from their gold mine in South Nyanza.

*Vermiculite*.—L. D. Gordon has increased his production from his claims in Machakos District by almost 300 per cent since 1967, producing 724 tonnes during 1969. M. J. Jessel had restarted production from claims in Samburu District by the end of the year.

#### (4) Oil

The B.P.-Shell Petroleum Development Company of Kenya Ltd. continued prospecting operations in the area held by them under a Special Oil Prospecting Licence in Coast and North-Eastern provinces.

Seismic refraction surveys continued during the year in the Lamu and Dodori areas. Expenditure in Kenya on these operations amounted to K£1,165,693.

### **(5) Prospecting Titles**

An Exclusive Prospecting Licence granted to Kenya Mining Company in Elgeyo-Marakwet District expired in January. Similar titles granted to Mineral Prospecting (Kenya) Ltd. in Embu District and A.C.I.F. Ltd. in Kajiado District expired in June and November respectively.

An Exclusive Prospecting Licence was granted to East Africa Mining Company Ltd. in Elgeyo-Marakwet District for the examination of fluorite deposits.

The Special Licence held by Migori-Nyanza Mines Ltd. in South Nyanza expired in October.

The Special Licence held by Somiren S.P.A. was reduced in area to 16,000 sq. miles and a second licence was granted to the same company over areas in Nyanza, Western and Rift Valley Provinces to prospect for radio-active minerals.

L. D. SANDERS

*Commissioner of Mines and Geology*



## APPENDIX I

### Statistics

#### (1) DEPARTMENTAL FINANCE

##### *I—Expenditure for the Financial Year July 1968 to June 1969*

	Personal Emoluments	Other Charges	Total
	K£	K£	K£
<i>Recurrent Expenditure—Mines</i>			
<i>Geological and Explosives:—</i>			
Sanctioned Estimates .. ..	47,000	74,970	121,970
Actual Expenditure .. ..	43,672	71,037	114,709
<i>Development Expenditure—Mineral resources survey in Western Kenya, mineral resources development, equipment, etc.:—</i>			
Sanctioned Estimates .. ..	3,747	1,000	4,747
Actual Expenditure .. ..	2,736	1,169	3,905
<i>Mineral Exploration:—</i>			
Sanctioned Estimates .. ..	2,450	18,000	20,450
Actual Expenditure .. ..	2,520	12,329	14,849
<i>Contract Drilling:—</i>			
Sanctioned Estimates .. ..	5,000	—	5,000
Actual Expenditure .. ..	4,964	—	4,964

##### *II—Revenue for the Financial Year July 1968 to June 1969*

	Estimated	Actual Receipts
	K£	K£
Mining Fees .. ..	9,000	29,262
Explosives Fees .. ..	1,300	1,204
Royalty on Carbon Dioxide Gas .. ..	2,700	2,709
Royalty on Gold .. ..	10,500	11,194
	23,500	44,369

#### (2) MINING INDUSTRY

##### I—RIGHTS AND TITLES

###### (1) *Prospecting Rights Granted and Renewed*

Granted	..	..	..	..	..	..	..	..	..	139
Renewed	..	..	..	..	..	..	..	..	..	31

(2) *Prospecting and Mining Titles Extant on 31st December 1969*

Exclusive Prospecting Licences	..	..	..	..	2
Special Licences	..	..	..	..	10
Claims (Lode)	..	..	..	..	821
Claims (Alluvial)	..	..	..	..	30
Special Leases	..	..	..	..	2
Special Oil Prospecting Licences	..	..	..	..	1

(3) *Details of Claims Extant on 31st December 1969*

Province	Precious Metals Lode	Precious Metals Alluvial	Precious Stones Lode	Non-precious Minerals Lode
Western	10	—	—	—
Nyanza	3	—	—	—
Central	—	—	—	13
Rift Valley	31	30	3	566
Eastern	—	—	54	136
Coast	—	—	—	5
North-Eastern	—	—	—	—
<b>TOTALS</b>	<b>44</b>	<b>30</b>	<b>57</b>	<b>720</b>

III—*Expenditure and Employment by the Mining Industry*

(1) *Prospecting and Mining Expenditure*

	1966	1967	1968	1969
	K£	K£	K£	K£
Prospecting	924,737	1,002,404	1,314,862	1,483,668
Mine Development	240,953	42,181	27,987	13,929
Mining and Milling	266,623	308,096	379,996	295,249
<b>TOTAL</b>	<b>1,432,313</b>	<b>1,352,681</b>	<b>1,722,845</b>	<b>1,792,846</b>

(2) *Number of Persons Employed in the Mining Industry and Total Basic Cash Wages Paid*

	1966		1967		1968		1969	
	Number	Amount	Number	Amount	Number	Amount	Number	Amount
		K£		K£		K£		K£
Technical	38	69,675	35	87,097	29	67,355	38	72,299
Executive	16	38,411	21	34,486	18	39,427	26	46,985
Supervisory	74	44,341	64	37,627	77	44,610	66	36,985
Skilled	269	63,890	255	77,209	116	30,935	129	27,476
Unskilled	741	66,610	778	73,763	766	80,494	721	70,078
<b>TOTAL</b>	<b>1,138</b>	<b>282,927</b>	<b>1,153</b>	<b>310,182</b>	<b>1,006</b>	<b>262,821</b>	<b>980</b>	<b>253,823</b>

The above figures are compiled from six-monthly returns submitted by registered holders of prospecting and mining titles. They do not include statistics relating to expenditure by producers of "common minerals".

## II—MINERAL PRODUCTION

(Figures are given to the nearest unit of weight and value)

(Figures in brackets are in respect of 1968)

Mineral	Quantity		Value K£	
Amethyst .. .. .	136	kg. (3)	1,150	(23)
Apatite .. .. .	17	gm. (1,134)	1	(25)
Aquamarine .. .. .	7,796	gm. (13,000)	2,000	(5,188)
Barytes .. .. .	435	tonnes (356)	11,408	(9,086)
Beryl .. .. .	3	tonnes (11)	430	(2,360)
Carbon Dioxide .. .. .	761	tonnes (819)	71,635	(76,204)
Chrysoprase .. .. .	(Nil)	kg. (87)	(Nil)	(63)
Copper .. .. .	77	tonnes (38)	40,444	(14,654)
Corundum .. .. .	119	tonnes (43)	4,259	(357)
Corundum (Ruby) .. .. .	2,391	gm. (9,072)	349	(90)
Diatomite .. .. .	2,303	tonnes (2,055)	32,241	(30,345)
Felspar .. .. .	1,560	tonnes (535)	24,938	(8,350)
Fluorite .. .. .	1,861	tonnes (192)	23,837	(2,977)
Galena .. .. .	11	tonnes (10)	314	(945)
Garnet .. .. .	116	kg. (210)	416	(60)
Gaylussite .. .. .	15	tonnes (82 kg.)	9,333	(50)
Gold .. .. .	556,847	gm. (994,954)	273,821	(448,009)
Guano .. .. .	360	tonnes (41)	6,342	(400)
Gypsum .. .. .	480	tonnes (501)	2,006	(1,742)
Kaolin .. .. .	1,472	tonnes (1,332)	36,225	(24,114)
Limestone Products	24,904	tonnes (18,566)	180,672	(125,561)
Magnesite .. .. .	503	tonnes (68)	4,622	(603)
Meerschaum .. .. .	1,851	kg. (82)	480	(80)
Mica .. .. .	(Nil)	kg. (371)	(Nil)	(45)
Quartzite .. .. .	(Nil)	tonnes (11)	(Nil)	(120)
Salt (Crude) .. .. .	4,924	tonnes (33,193)	39,535	(457,718)
Salt (Refined) .. .. .	37,361	tonnes (27,806)	358,499	(274,157)
Sapphire .. .. .	2,839	gm. (5,611)	5,286	(1,659)
Silver .. .. .	51,880	gm. (86,186)	1,070	(2,146)
Soda Ash .. .. .	105,908	tonnes (117,244)	1,118,046	(1,203,552)
Soda Crushed Raw .. .. .	2,568	tonnes (2,283)	24,953	(21,834)
Tourmaline .. .. .	604	gm. (91)	791	(74)
Vermiculite .. .. .	776	tonnes (279)	2,702	(820)
Wollastonite .. .. .	691	tonnes (1,382)	6,000	(21,567)
			2,283,805 (2,734,978)	
<i>Materials for Cement Manufacture</i>				
Gypsum .. .. .	61,365	tonnes (41,087)	93,601	(103,204)
Kunkur .. .. .	95,697	tonnes (65,748)	43,957	(29,991)
Limestone .. .. .	822,287	tonnes (731,100)	338,983	(239,501)
Shale .. .. .	141,066	tonnes (89,530)	60,830	(44,060)
Volcanic Ash .. .. .	1,666	tonnes (3,919)	273	(2,946)
			2,821,449 (3,154,680)	
<i>Cement Production</i> .. .. .	653,091	tonnes (542,903)	5,464,450 (4,831,218)	

(3) EXPLOSIVES

*Explosives Imported, Re-exported, Sold and Stored by Dealers  
(Figures are to the nearest unit)*

Type	Unit	Stock 1-1-69	Total Imports	Re-exported	Kenya Sales	Stock 31-12-69
HIGH EXPLOSIVES CLASS III						
Gelignite .. .. .	50 lb.	2,204	43,693	18,561	18,937	8,399
Blasting Powder .. .. .	25 lb.	175	4,000	Nil	2,645	1,530
ACCESSORIES						
No. 6 Aluminium Detonators .. .. .	1,000 No.	366	1,181	748	450	348
Electric Detonators .. .. .	No.	36,265	812,000	751,332	46,683	50,250
Cordtex Fuse, Reels .. .. .	500 ft.	208	11,620	3,556	5,518	2,754
Safety Fuse, (ICI), Reels .. .. .	2,400 ft.	—	2,148	579	473	1,096
Safety Fuse, (CFD), Reels .. .. .	2,500 ft.	688	—	382	306	Nil
Safety Fuse, Coils .. .. .	24 ft.	1,547	42,000	8,072	13,263	22,212
Igniter Cord Fast, Reels .. .. .	500 ft.	978	4,400	1,964	594	2,820
Igniter Cord Slow, Reels .. .. .	1,000 ft.	136	1,240	474	60	842
Fuse Igniters .. .. .	No.	49,730	70,000	33,440	11,750	74,540

## APPENDIX II

### REGISTERED HOLDERS OF PROSPECTING AND/OR MINING TITLES AS AT 31ST DECEMBER 1969

<i>Name and Address of Registered Holder</i>	<i>Mineral</i>
Abdalla, I., P.O. Box 1493, Mombasa .. .. .	Gypsum
A.C.I.F. Limited, P.O. Box 2966, Nairobi .. .. .	Gaylussite
Ansurfox Mining Co. Limited, P.O. Box 873, Nairobi .. .. .	Gold
Bamburi Portland Cement Co. Ltd., P.O. Box 1846, Mombasa	Gypsum
Bayusuf, S. A., P.O. Box 3, Garissa .. .. .	Gypsum
Bhakoo, K. C., P.O. Box 2658, Nairobi .. .. .	Aquamarine, Beryl, Barytes
BP-Shell Petroleum Development Company of Kenya Ltd., P.O. Box 9810, Mombasa .. .. .	Mineral Oil
Carbacid (1961) Limited, P.O. Box 30564, Nairobi .. .. .	Carbon Dioxide Gas
Ceramic Industries of East Africa Ltd., P.O. Box 8720, Nairobi	Talc, Felspar
Chinswood Graphite Ltd., P.O. Box 8997, Nairobi .. .. .	Graphite
Continental Ore (Kenya) Ltd., P.O. Box 30610, Nairobi .. .. .	Aquamarine, Beryl, Corundum
Dunn, C. P. R., P.O. Box 9542, Nairobi .. .. .	Sapphire, Corundum
East Africa Mining Co. Limited, P.O. Box 1302, Mombasa	Fluorite, Sulphur
East African Prospectors, Mines and Minerals Agent Co., P.O. Box 27285, Nairobi .. .. .	Aquamarine, Beryl
East and Central Africa Mining Company Limited, P.O. Box 8085, Nairobi .. .. .	Aquamarine, Beryl
Funnell, J., P.O. Box 9360, Nairobi .. .. .	Gypsum
Gichure, O., P.O. Box 12006, Nairobi .. .. .	Diatomite
M. Gonella and Co. Limited, P.O. Box 5154, Nairobi .. .. .	Wollastonite, Talc, Tremolite, Felspar
Gordon, L. D., P.O. Box 8997, Nairobi .. .. .	Vermiculite, Garnet
Jessel, M. J., P.O. Box 237, Nanyuki .. .. .	Chromite, Vermiculite
John Heffer (Mining) Ltd., P.O. Box 11944, Nairobi .. .. .	Felspar, Gypsum
Kenya Guano Ltd., P.O. Box 7363, Nairobi .. .. .	Guano
Kenya Minerals Co., P.O. Box 237, Nanyuki .. .. .	Beryl
Kenya Mineral Development Corporation Ltd., P.O. Kangundo .. .. .	Beryl, Corundum
Kenya Mining Co., P.O. Box 134, Eldoret .. .. .	Aquamarine, Beryl, Copper, Galena, Fluorite
Kibongwa Mines Limited, P.O. Box 130, Kisumu .. .. .	Gold, Silver
Kieya, J. M., P.O. Box 4042, Nairobi .. .. .	Aquamarine, Beryl
Kikuyu Embu Meru Mining Industry Co., P.O. Box 7677, Nairobi .. .. .	Aquamarine, Beryl
Lonata Promotions Limited, P.O. Box 9669, Nairobi .. .. .	Corundum
Markham and Company Limited, P.O. Box 2619, Nairobi	Felspar, Magnesite, Sapphire, Corundum
Merrett, S. J., P.O. Box 7375, Nairobi .. .. .	Aquamarine, Sapp- hire, Corundum
Migori-Nyanza Mines Limited, P.O. Macalder Mines .. .. .	Copper, Gold, Silver
Mineral Mining Corporation (1965) Limited, P.O. Box 18273, Nairobi .. .. .	Barytes, Felspar, Ga- lena, Gypsum, Quartz
Mineral Prospecting (Kenya) Ltd., P.O. Box 30158, Nairobi	Precious Stones (Diamonds)
Mogul Mining Company Limited, P.O. Box 12537, Nairobi	Copper

APPENDIX II—(Contd.)

REGISTERED HOLDERS OF PROSPECTING AND/OR MINING TITLES  
AS AT 31ST DECEMBER 1969

<i>Name and Address of Registered Holder</i>	<i>Mineral</i>
Mwanthi, J., Mwala Location, Siathani Market, Machakos	Fluorite, Corundum
Pankhania, J. G., P.O. Box 3199, Nairobi .. .. .	Gypsum
Pechiney-Saint-Gobain, P.O. Box 5305, Nairobi .. .. .	Rare Earth Minerals
Power Securities Corporation Ltd., and East African Power and Lighting Co. Ltd., P.O. Box 8454, Nairobi .. .. .	Geothermal Steam
Rayetta Estate Limited, P.O. Box 2340, Mombasa .. .. .	Guano
Samuels, R. C., P.O. Box 242, Kakamega .. .. .	Gold, Silver
Saul, J. M., P.O. Box 4775, Nairobi .. .. .	Aquamarine, Beryl
Simons, J. W. E., P.O. Box 7363, Nairobi .. .. .	Guano
Somiren, S. P. A., P.O. Box 20400, Nairobi .. .. .	Radio-Active Minerals
Tanganyika Meerscham Corp. Ltd., P.O. Box 3151, Arusha	Meerscham
Tharaka Mining Company, P.O. Tharaka, Meru .. .. .	Aquamarine, Beryl
Tropical Mining Company, P.O. Box 11993, Nairobi .. .. .	Beryl, Copper
Valpy, J. A. (deceased), P.O. Box 331, Kitale .. .. .	Asbestos
Varma, A. S., P.O. Box 16, Athi River .. .. .	Gypsum
Vayani, W. T., P.O. Box 5199, Nairobi .. .. .	Gypsum
Wananchi Gold Mines Limited, P.O. Box 6016, Nairobi .. .. .	Gold, Silver
Wolf, E. F. W., P.O. Box 30675, Nairobi .. .. .	Beryl
Yakas, A., P.O. Box 563, Nakuru .. .. .	Aquamarine, Beryl, Corundum

APPENDIX III

PRINCIPAL PRODUCERS OF "COMMON MINERALS"

<i>"Common Mineral" Produced</i>	<i>Name and Address of Producer</i>
Cement .. .. .	Bamburi Portland Cement Co. Ltd., P.O. Box 1846, Mombasa.
Diatomite .. .. .	East African Portland Cement Co. Ltd., P.O. Athi River.
Kaolin .. .. .	African Diatomite Industries Limited, P.O. Box 32, Gilgil.
Limestone Products .. .. .	Eburru Settlement Farmers' Co-op. Society Limited, P.O. Box 54, Gilgil.
Salt .. .. .	Refractories Limited, P.O. Box 8152, Nairobi.
	Homa Lime Ltd., P.O. Box 1, Koru.
	Kenya Marble Quarries Ltd., P.O. Box 834, Nairobi.
	Limesales Ltd., P.O. Box 2699, Nairobi.
	Magadi Soda Co. Ltd., P.O. Magadi.
	Fundisha Salt Works Ltd., P.O. Box 892, Nairobi.
	Ngomeni Salt Works, P.O. Box 304, Malindi.