Council Paper No. 130 of 1906.

MINES.

Report of the Inspector of Mines for the two years ending 31st August, 1906.

Laid before the Legislative Council on the 5th November, 1906.

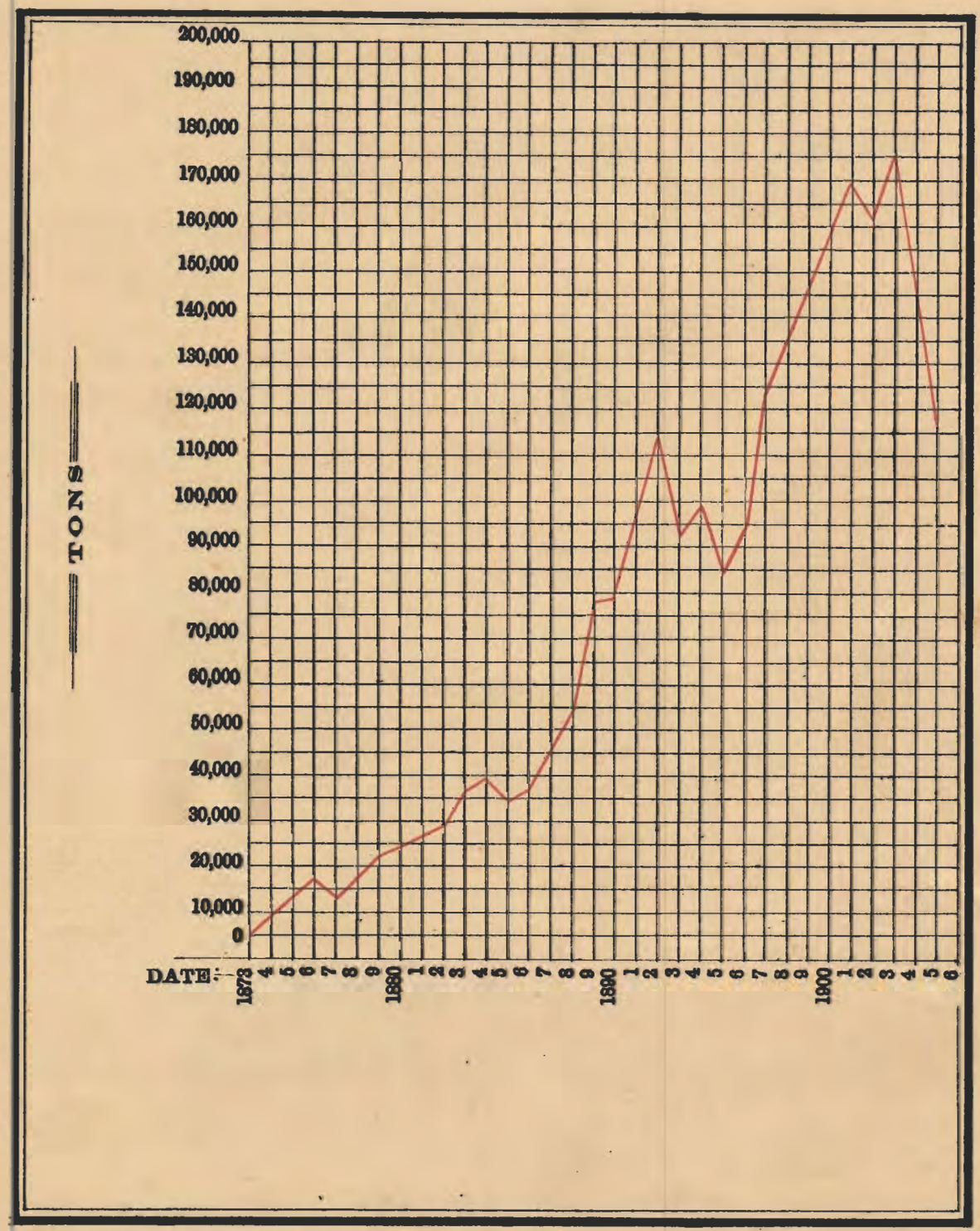
Previous Council Paper No.

Registered No. of Correspondence relating to the subject—M.P. No. 5775/1906.

TRINIDAD:
PRINTED AT THE GOVERNMENT PRINTING OFFICE, PORT-OF-SPAIN.

1906.

FIG. 1.



asphalt exported.

NOTE.—Diagram compiled from export returns, 1903 Statistics are for 13 months, and a deduction has been made for the diagram.

MINES.

Report of the Inspector of Mines for the two years ending 31st August, 1906.

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MINES OFFICE,
30th September, 1906.

SIR,

I have the honour to submit for the information of His Excellency the Governor, a report on the work which has come under my direction during the period ending September 1st 1904, and September 1st, 1906.

2. The inauguration of a department of mines occurred soon after my arrival in the Colony, its object was primarily to carry out the technical adjustment of the asphalt industry, as laid down by the Asphalt Ordinance, and also to introduce and administer legislation to bring about the safe working and regulation of such industries as mines, borings, quarries and factories.

Such matters as the granting of Crown mining licenses and leases have not as yet received the attention of the department.

3. In future, I propose to submit an annual report, containing details of the work done during the calendar year. It is also intended to tabulate the statistics, (obtained under the Mines, Borings and Quarries Ordinance) of the quantity of minerals won, number of persons employed, and the number of accidents which have occurred during the year, with detailed information of those from which a lesson may be drawn, which may be of assistance in preventing similar accidents.

OFFICIAL DUTIES.

4. The official duties of the department have been carried out by myself, with the assistance of a surveyor where occasion demanded it. The work has included: the inspection of Mines, Borings, Quarries, Factories; inquiry into accidents which have come under notice; attending inquests; and legal proceedings against owners; the general supervision of exploration work in the Cunapo Coalfield; surveys and numerous inspections of the La Brea pitch deposits together with the inquiry into and reporting on legislation in connection with the asphalt industry.

The reporting on the proposed legislation for the regulation of mines, boring and quarries, the regulation of factories and other incidental matters have taken up considerable time

5. Special duties were undertaken as follows: A consultation was held with the Asphalt Commissioners in England. The manjak mines of Barbados were inspected. Some 14 days were taken up in assisting the Government Electrical Engineer in technical matters in connection with the installation of wireless telegraphy between Trinidad and Tobago, and during the illness and absence of the Government Geologist from the Colony, the routine work in connection with matters arising out of the survey were attended to.

MINING.

6. Asphalt mining, or more correctly speaking, asphalt digging, comprises the major portion of the mineral industry of the Colony.

Fig. 1 is a diagram of the asphalt exported from 1873. The curve, although not absolutely correct, gives a fair idea of the growth of the industry. An inaccuracy has crept into the curve, in that the shipments of crude and refined asphalts are totalled together without the necessary correction to reduce the refined to crude or *vice versâ*. In recent years the amount of refined asphalt has increased.

7. Asphalt mining operations are confined to the district of La Brea, and are in the hands of comparatively few owners. The New Trinidad Lake Asphalt Company the concessioners of the Pitch Lake, are by far the largest shippers. During the last two years, 1904 and 1905, 87 per cent. of the asphalt worked has been extracted from the Pitch Lake; the remaining portion being mined from the asphalt bearing land, lying to the north-east of the Lake and known as the Village diggings.

8. The mining of a viscous deposit, such as asphalt, where excavations in the course of time, become filled and re-filled from the asphalt contained in the surrounding lands, has in the absence of suitable regulations been the cause of much litigation. The owners of asphalt land, who did not feel disposed to mine their property, used every means to enforce the

recognised mining law of ancient level and lateral support. Endless litigation ran hand in hand with the industry. On the petition of some of the asphalt owners, a Royal Commission made an inquiry into the matter, and after lengthy and searching investigation recommended legislation under the administration of a mining engineer.

9. The Asphalt Industry Regulation Ordinance was passed in May, 1906, and defines the mining rights of asphalt. It gives protection on the one hand to legitimate mining against the "harassing litigation" complained of; it provides, on the other hand, a means by which an injured owner may get assessment of any undue damage to his property. The Bill has now been in operation some four months, and although not long enough to enable me to report definitely on its practical application, I see no reason to doubt its bringing about a fair and equitable adjustment of the industry.

10. No mining has yet been carried on under permit as provided in the Bill, the owners at present preferring to dig under notice, without confining themselves to the regulations. Application for damage has already been made in respect of eight parcels of land, in connection with one digging, with the result that in two cases certificates were granted. In the administration of the Bill to date, no less than 3,300 level points have been recorded. The mode of procedure at the present time in the case of digging under notice, may be briefly stated as follows: On the receipt of notice of intention to dig any parcel of land, the levels of the adjoining properties are recorded. If subsequently an adjoining owner, applies for a certificate of depletion, and pays £5 the levels are again recorded. Upon inspection of the property, and comparison of the levels, assessment of undue damage is certified or not in accordance with the result of the investigation.

I am inclined to think, that after a little experience with this method of assessing damage, it will be possible to lay down the standard of subsidence. At present each case has to be dealt with upon its merits.

11. La Brea Mining Village.—The boundaries of the properties in this area were found to be very uncertain and indefinite. There were no reliable plans in existence. Plans had been made from time to time, but unfortunately no attention was given to fixing the boundaries of the unstable asphalt area with relation to solid land in the district. Such an indefinite state of affairs, it will be readily understood, played no mean part in the many battles before the courts.

12. The necessity of definitely fixing the Asphalt properties by means of permanent marks on solid ground, from which the boundaries could be located, and the levels recorded, at once become obvious. Legislation was considered and the La Brea Survey Ordinance introduced. This Bill gave the necessary powers for making the plan and fixing monuments and bench marks on solid ground.

The work in connection with the Bill was entrusted to Mr. Hugo Massy, a surveyor of considerable repute and experience in the Colony. Although the work was not directly under my department, close attention has been paid to its progress, on account of its important bearing upon the Asphalt Industry. The plan is now complete and was posted in compliance with the Ordinance, for three months, before being declared the authentic plan of the area.

Fig. 2* is a photograph of the plan.

13. The Pitch Lake.—A survey of the Pitch Lake was made in 1902, which showed the lake to have an area of 127 acres. In this survey, the boundary was delineated where there was found to be a rise in level. On examination I found that the area so defined did not give an accurate idea of the extent of the lake, whose boundary, particularly at the south and north-east, is covered with a subsoil which is gradually sinking with the general fall in level of the lake. A re-survey has been undertaken by my department, in order to arrive at a more reliable estimate of this deposit, and in order to fix the position of the lake, with relation to the new monuments and bench-marks erected in preparing the plan of La Brea Village. The survey has been made jointly with Mr. F. R. Bartlett, the general agent of the Concessionaires. The location of the rim was a source of considerable anxiety and at numerous points, excavations and borings were resorted to. The survey shows the lake to be of greater area than hithertofore recorded. The matter will form the subject of a special report.

14. From levels made by the Asphalt Company, the level of the lake has been observed to fall between 1893 to 1906 a distance of 7·1 feet. During the period nearly 1½ million tons of asphalt had been extracted. These figures are of considerable interest, in that they show the fallacy of the general accepted idea that the Pitch Lake is inexhaustible. The record also shows that for all practical purposes the reduction in level of the lake is in direct ratio with the amount of pitch extracted.

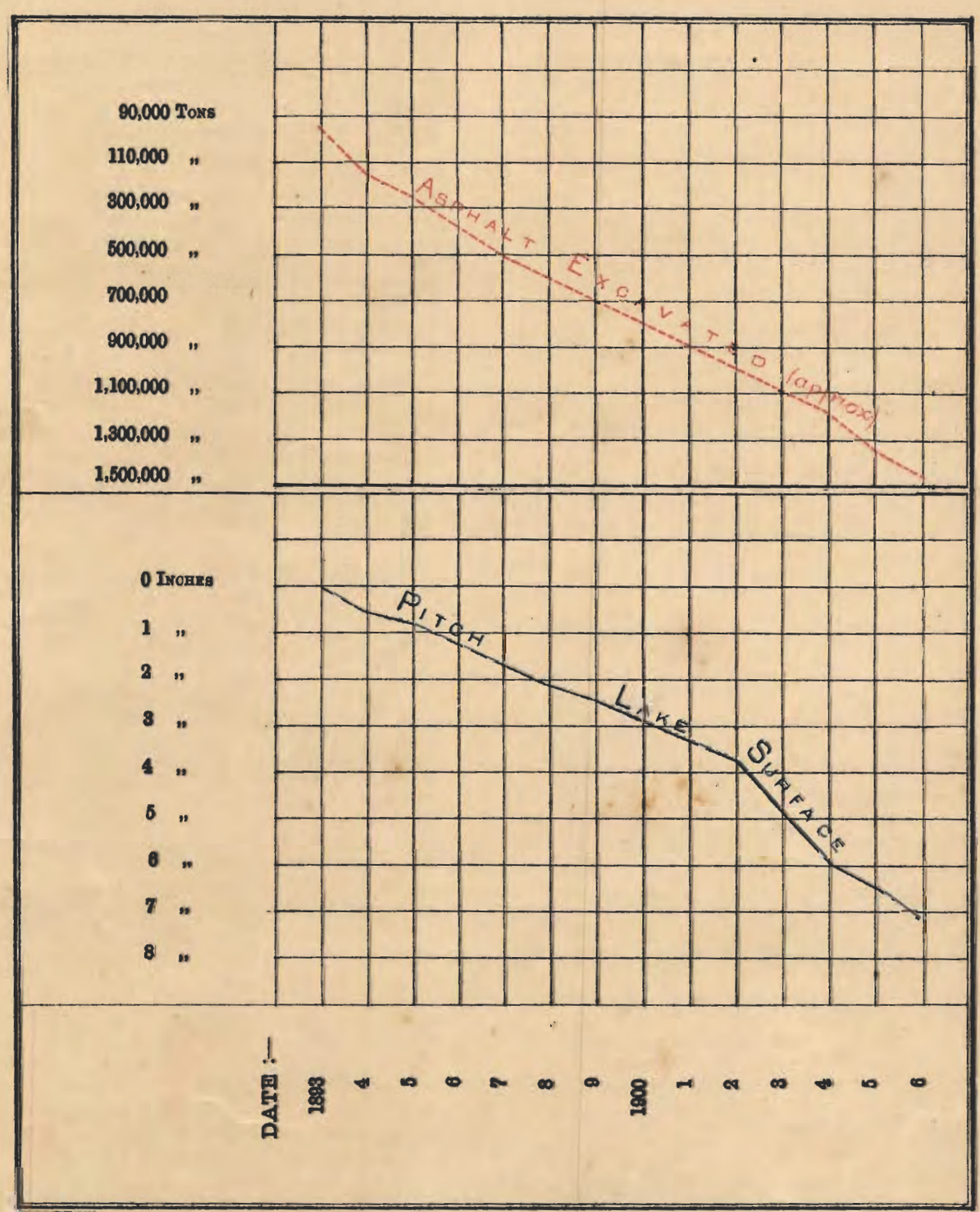
Fig. 3 shows the reduction in level of the Pitch Lake, and the corresponding output.

Fig. 4 is a photograph taken at the drain on the north side of the lake, which has been cut to allow the surface water from the lake to flow to the sea. The photograph shows the approximate position of the original and the present level.

15. Manjak Mining.—This mineral bitumen is mined in the San Fernando district, and as only two mines are at present in operation it cannot be said to be extensively worked. A

* Not reproduced.

FIG. 3.


90,000 Tons
110,000 „
300,000 „
500,000 „
700,000
900,000 „
1,100,000 „
1,300,000 „
1,500,000 „
ASPHALT EXCAVATED (approx)
0 Inches
1 „
2 „
3 „
4 „
5 „
6 „
7 „
8 „
PITCH LAKE SURFACE
DATE :-
1893
4
5
6
7
8
9
1900
1
2
3
4
5
6

geological survey has been made by the Government Geologist, and although little definite information as to the location of the deposits has been obtained, further than is afforded by the mapping of the area of the Tertiary rocks in which the manjak occurs, it must not be forgotten that much exploration work still remains and no doubt many valuable veins will yet be revealed.

16. The use of Trinidad manjak in the arts has up to the present time been somewhat limited. There is, however, little reason to doubt that in the near future a ready market will be found for this product, and that manjak mining will become a substantial industry in the Colony

17. The industry has been much disturbed by a lamentable explosion which occurred at the end of December, 1904, causing the death of 17 miners. This took place at the Vista Bella mine, which had reached a depth of 200 feet, and was working on a lenticular deposit of manjak dipping at 70 degrees.

18. The workings of the mine were being carried on with naked lights, very meagre attention being given to supervision, and an outburst of inflammable gas occurred which, became ignited by a naked light. At the time there was no mining legislation in force, and a code of rules submitted to the mine owners by my department were unfortunately not enforced. At the inquest the Coroner returned a verdict of culpable negligence against the owners and manager. Proceedings were subsequently taken by the Crown against the owners and manager on a charge of manslaughter, which resulted in an acquittal. A qualified manager is now in charge of the mine.

19. A word of warning will not be out of place, to anyone contemplating entering any mining industry.

The cheese-paring policy of conducting a mine or any allied industry with inadequate and unqualified supervision, cannot be expected to end in anything but failure, and disappointment to the shareholders.

Efficient laying out of the workings, and patience during the development of the undertaking, are features which cannot be overlooked if ultimate success is desired. The driving of unnecessary levels, the "robbing of pillars" to meet an immediate order, are which disturb the adjacent strata, and crush the sides of the [illegible] an extent as to render the work highly dangerous, and to cause continual expense otherwise be avoided. Further than this, by such methods, entirely the result of inexperience and inefficient supervision, much of the deposit will be placed in too dangerous and costly an environment ever to be worth working.

20. Investigation of the gases associated with manjak has thrown considerable light on an important point not only connected with manjak mining, but with reference to mine gases in general. During an inspection of the Barbados mines a cavity was found in the roof of a heading, containing a mixture of gases which extinguished a safety lamp when raised into it. Yet, only the faintest indication of a firedamp cap was visible, and even this, not in the least characteristic, and only discerned with great difficulty. A sample of gas was obtained in an

imperial quart bottle by water displacement, and was submitted to Professor P. Carmody, the Government Analyst, who was good enough to supply me with the following analysis :—

O_2	14·00	Air ...	O_2 / N_2 66·9
CH_4	11·10		
H_2	1·60	Nitrogen ...	...N_2 ... 20·4
N_2	73·30	Inflammable gas CH_4 & H_2	... 12·7

The analysis proved the gas to be of a highly dangerous character, only requiring the addition of more air to render it an explosive mixture.

21. The discovery of such a mixture of gases, which defied this usual safety lamp test, is, of course, of considerable importance, and one which must not be lost sight of. I submitted the facts of the case to Dr. Haldane, F.R.S., who was kind enough to give me the benefit of his wide experience on these matters, and suggested that the cause of the deficiency of oxygen in the sample analysed was possibly due to the absorptive properties of the manjak. Samples of air from the Barbados and Trinidad mines were obtained for analysis, and clearly proved that oxygen was being absorbed more rapidly than under similar conditions in coal mines. At the same time the analyses invariably recorded the presence of oxidation products. (CO_2, SO_2, CO.)

22. The Government Analyst, Professor P. Carmody, with the assistance of Mr. B C. Burt, was good enough to undertake some research in order to demonstrate the absorptive property of manjak.

The manjak used was of the lustrous variety, showing no trace of columnar jointing, breaking with conchoidal fracture and of the following composition :—

Water and volatile matter	4·56 per cent.
Organic matter	90·96 ,,
Mineral matter	4·48 ,,
The organic matter contained :	
Bitumen	90·60 per cent.
Other than Bitumen	·36 ,,
and containing Petroline	15·60 ,,

About 30 grammes of the sample, freshly taken from the mine, and broken to the size of small peas, was confined with 60cc. of air, and after a week's duration, the air was drawn off from the sample and found to have the following composition :—

CO_2 and SO_2	·6
CO	·6
CH_4	Nil.
Unsaturated Hydrocarbons	1·2
O_2	12·0
N_2	85·6
Oxygen absorbed	9·00 per cent.
,, required CO_2 and CO	0·09 ,,
,, absorbed and not used in forming gaseous oxidation products	8·01 ,,
Diminution in Petroline	1·80 ,,

A similar sample, which had been exposed to the air of the Laboratory for a week, was enclosed for five weeks, and the analysis of the air drawn off was as follows :—

CO_2 and SO_2	·75
CO less than	·20
Unsaturated Hydrocarbon	·35
CH_4	1·00
O_2	14·90
N_2	83·00
	100·00
Oxygen absorbed	6·10 per cent.
Required for CO_2 and SO_2	·85 ,,
Oxygen absorbed and not used in forming gaseous oxidation products	5·02 ,,
Diminution of Petrolene	1·04 ,,

Although the experiments are only preliminary, I record them, as they clearly shew that manjak has the property of absorbing oxygen from the air, and confirms the conclusions drawn from the analysis before referred to.

23. The presence of carbon mon-oxide is important, since it has been repeatedly found in samples of gas collected from the manjak mines. Several complaints were received of the workmen suffering from head-aches, which might have been due to carbon mon-oxide poisoning. Since more attention has been paid to the ventilation, no such complaint has come to my notice. The presence of the gases sulphuretted hydrogen and sulphur di-oxide although only in very minute amounts, produce smarting of the eyes, which is particularly noticeable in working in badly ventilated ends, or removing water from disused sumps. The pungent smell of sulphuretted hydrogen is very evident when work is being vigorously conducted at the face. The remedy is

to be found in a better circulation of air, carried right up to the work, to ensure the gases being swept away immediately they are given off. The subject is still under investigation.

24. The result of the investigations already carried on may be briefly summarised as follows:—

(*a.*) Inflammable gas is associated with manjak.

(*b.*) Manjak possesses the property of readily absorbing oxygen.

(*c.*) By the combination of (*a*) and (*b*) unventilated parts of a mine may become fouled with inflammable gas at the same time the oxygen in the air may be so diminished as to render the inflammable gas very difficult to detect by the ordinary safety lamp.

25. The following conclusions are drawn from:

(*a.*) No lamps other than locked safety lamps should on any account be used in any mine working manjak.

(*b.*) The ventilation should be continuous and adequate, and no part should be left unventilated unless it be securely fenced off.

(*c.*) Great care should be exercised in removing any stagnant air, and this should only be done by competent men, after the workmen have been removed from the mine.

26. If dry manjak be ground to a very fine powder and thrown into the flame of a spirit lamp, it is found to be highly inflammable. The mines at present working in the Colony, are by no means dry and dusty, and little dust is ever to be found in the mines. This feature of the mineral should however be borne in mind, in the event of any of the working becoming dry and dusty.

Blasting has not, up to the present, been necessary in working the mineral.

27. CUNAPO COAL.—A special report an the Cunapo Coalfield was submitted at the conclusion of the exploration work.

A geological survey was made of the area. The seams (two in number) were dipping at a high inclination (over 40°), so that preliminary proof by boring had to be abandoned. An adit was driven into the side of the hill under which the seams passed, both seams were intersected, and levels driven along the strike of the seams The coal was found to be somewhat erratic and variable in thickness, occurring in lenticular patches. Further exploration was not considered necessary as the available area has been proved sufficiently for the guidance of anyone desirous of working the coal.

28. The question of making patent fuel by washing and compressing into briquettes, was fully considered, and although impracticable on a large scale, may be well worth attention on a restricted output.

The coal is a Tertiary lignite of very fair quality, and had the thickness of the seam only been more uniform, it would have been of great commercial value.

The Cunapo Coal in the Sangre Grande district is the only coal that has been examined by my department.

29. GOLD.—It has been commonly supposed that Trinidad, being so near to Venezuela, where gold is supposed to be abundant, should be a veritable El Dorado. Such opinions are usually based upon mere empirical reasoning, without any attempt to prospect on the meanest scientific methods. During the period under review, several attempts have been made to find gold, but with little or no success. A mine was opened in one locality, in the northern range, on a supposed reef of quartz, but was abandoned before the reef was reached. The country rock in which this mine is situated is composed of a series of mica, talc-mica and quartzose schists, with schistose grit bands, well foliated and containing segregation veins of quartz.

The geological survey at present in progress has not yet extended to this portion of the Colony.

Whilst on a visit to Tobago, the locality of Little Englishman's Bay, which was said to contain gold was inspected. The investigation possibly in the short time at my disposal did not prove very encouraging.

30. QUARRIES.—The quarries in operation are chiefly engaged in working road-metal and limestone for lime-burning. Quarrying is carried on in a most "happy-go-lucky" fashion. Blasting, to a great extent proceeds, under conditions which have long proved highly dangerous; gunpowder and other explosives are frequently rammed into a short hole, with a steel drill or piece of iron, and if the shot happens to miss-fire—a not unfrequent occurrence—the hole is drilled out and another charge inserted in the same hole.

Many of the quarries which have come under my notice, are situated in very near proximity to public roads and private dwellings, and very little attention appears to be given to warning people in the neighbourhood when blasting is about to take place.

The tops of quarries, many in a highly dangerous state are frequently unfenced, and it appears that attention is barely given to this important matter.

31. The extraction of stone from the quarry itself is frequently carried on in blissful ignorance of the dangers of the undertaking. A good bed of stone is excavated under the face of broken overhanging debris, until a fall takes place, which temporarily stops work, or injures the unfortunate people working below.

Fig. 5 is a photograph taken at Rose Hill Quarry, Port-of-Spain, showing how John Pollard

was killed on the 5th of December, 1904. In this case, the quarry had been undermined to the extent of 15 feet, a highly unworkmanlike proceeding.

32. Where such dangerous methods came under my notice, immediate attention was called to them, and in many cases subsequent visits were paid to ascertain if the matter had been given attention. On the whole, I found the owners very willing to make any alteration which would tend to the greater safety of their employees; in fact they were generally ignorant of the dangers which they were allowing their workmen to run.

It is somewhat singular that so few accidents occur; there is, however, no record kept, and only fatal or very serious accidents get publicity as a rule. A scheme of legislation was considered and a special report on the subject submitted

33. OILFIELDS.—The surface indications of oil are exceptionally promising throughout the southern portion of the Island. A geological survey has been made and a number of maps and reports issued, from which valuable information can be obtained by intended prospectors and drillers. The greater part of the ground has been mapped, and the general structure, with dips and thickness of oil-bearing rocks recorded. All that remains to be proved is the oil-bearing capacity of the oil sands within workable depths, which can only be done by actual boring.

Boring operations in the Guayaguayare district, have been resumed, and are now in active progress. A considerable quantity of oil has been bailed from one of the wells and there is every reason to believe that the prospecting stage in this area has passed, and that oil will shortly be an important industry in the Colony.

34. Special regulations, with a view to the safe working of borings, have been submitted by my department, with relation to the works at present in progress. It is proposed to extend the Mines Ordinance now under consideration to the regulation of borings. During the period under review little boring has been in progress, and few, if any, accidents occurred. A serious boiler explosion, however, occurred when work was active in 1903, but little information is available.

FIG. 5.

ROSE HILL QUARRY.

A somewhat singular accident, which might have terminated fatally is worthy of note. On 18th April, 1906, a well, situated at Brighton, belonging to the New Trinidad Lake Asphalt Company, Limited, was being opened. The well had not been used for a number of years, and a thick sticky oil had been exuding from the hole and running to waste. The mouth of the hole was being repaired in order to attach a pipe and allow the oil to run into storage barrels instead of into the sea. A rectangular well had been sunk to a depth of 10 feet, around the top of the bore-hole. A man was employed cleaning out this well, and had been at work some ten minutes, when he suddenly fell unconcious, being overcome by the gases exuding with the oil. He was unconscious for some hours after being carried from the well, and the symptoms described are not unlike those of carbon mon-oxide poisoning. The necessity is apparent for the ventilation of such places and providing proper means of escape.

35. FACTORIES.—A considerable number of the factories in the Colony have been visited with reference to the necessity of an Ordinance for their regulation. A special report on the subject with suggested regulations was submitted in August, 1905. "At many of the factories visited little attention is paid to the adequate fencing of machinery, and in the course of my inspection, I heard incidentally of several accidents which could have been avoided by a little fencing. The majority of the boilers examined were of the multitubular type, a class of boiler admirably adapted to the work required. At the majority of the larger factories visited the boilers appeared to be well cared for and under proper supervision"

36 "The boilers at Sugar Factories are only used in the grinding season, during which time they are driven in many cases to their utmost capacity. When the mills are not at work during the interval between "crops," the boilers are "laid off" and appear to be started again, frequently with only a very cursory examination.

Such irregularities as defective boiler fittings, excessive tube-plugging, &c., were noted. At one factory of considerable size, I found that bricks had been tied to the safety valve to increase the boiler pressure. At another, I found a boiler working at a considerable pressure without a water gauge. Such practices are highly dangerous and to be strongly condemned, and are in themselves quite sufficient evidence for the necessity of an Ordinance on the subject.

A number of accidents occur on sidings and railways connected with factories, which regulation could prevent in many cases."

37. ANKYLOSTOMIASIS.—The prevalence of this disease amongst the labourers of the Colony is a matter which I have already referred to in my special report on the proposed Factory Ordinance. My remarks are not intended to refer in any way to any of the distressing cases which come under the observation of the Medical Profession.

It has now been clearly proved that the larvæ of the Ankylostoma can take up its abode in the human body and cause a gradual reduction in labour capacity without producing in its early stage any serious indisposition necessitating medical treatment. A person who becomes slowly infected in this way does not realise that he is infected; he goes on with his work, with slowly diminishing power. The employer does not appreciate the real cause of his labourer's condition, although he is fully alive to the fact that the "amount of work done per person employed" is gradually decreasing.

38. If this appalling disease is to be combatted with any hope of success, rigid sanitary regulations must be adopted, and I venture to suggest, that sanitary regulations could be added to the proposed Factory Ordinance, compelling the employers of labour to provide sufficient suitable sanitary conveniences, and at the same time a penalty for pollution of the ground. I am inclined to think that such an "innovation" as the suggestion has been called, would meet with the hearty support of both labourer and employer, when the vital necessity of such a measure was pointed out.

39. ACCIDENTS.—The accidents in mines and open works during the years 1904 and 1905, as far as have been ascertained, are as follows:—

Year.	Kind of Mine or Open work.	Underground.	Above.	Total.	
1904	Manjak Mine	17	...	17	Explosion.
	Limestone Quarry	...	1	1	Fall of Stone.
	Asphalt	..	2	2	Non-fatal.
1905	Manjak Mine	1	..	1	Fall down shaft.
	Quarry	...	1	1	Non-fatal.
	Asphalt	...	1	1	Non-fatal.

40. During the year 1904, 8 fatal accidents occurred to persons employed about factories and may be classified as follows:—

4 fatal—Crushed by Cane trucks.
1 „ Boiler tube explosion.
1 fatal—Crushed by sugar machinery.
1 „ Fall into tank of hot water.
1 fatal—Fall from roof of Factory.

There were also 6 non-fatal accidents recorded, caused by falls from cane trucks whilst in motion, and one boiler explosion.

No statistics for 1905 have been obtained.

41. There being no obligation on the part of the owners or managers of works to report accidents, all the figures here referred to can only be considered as very approximate, and only then represent accidents of fatal or almost fatal nature. There is little doubt that there are many accidents which are not heard of beyond the locality in which they occur. The necessity of a complete record of all accidents needs no proof. The proposed Ordinance now under consideration, will make it compulsory for the owners to report all accidents where loss of life, or serious personal injury, has occurred. My department will thus be able to keep a complete record, which will be of invaluable assistance in bringing about the safe working of all Mines, Borings, Quarries and Factories.

42. LEGISLATION.—The details of the following legislation have received considerable attention during the period under review :—

(*a*) Asphalt Industry Regulation Ordinance.

(*b*.) La Brea Survey Ordinance.

(*c*.) Mines Ordinance.

(1.) Mines Regulation.

(2.) Borings Regulation.

(3.) Quarry Regulation.

(*d*.) Factory Ordinance.

43. ASPHALT INDUSTRY REGULATION ORDINANCE.—This legislation came into operation on the 11th May, 1906. The Ordinance may be summarised as follows :—

(*a*.) No digging operation can be commenced without giving 14 days notice.

(*b*.) Digging operations may be carried on under Regulation by Permit, which frees the digger from actions by injunction.

(*c*.) An owner of land adjacent to a digging may on payment of £5 obtain a certificate of the material lost by the digging operations complained of, whether conducted by Permit or otherwise.

(*d*.) The certificate when granted is final and conclusive.

The regulations under the Ordinance are designed with a view to permit digging to be conducted without causing undue depletion of adjacent land. The digger must send to the Inspector of Mines a statement of the material excavated and must not cut or pare off the sides of his excavation after once it has been dug—in fact he must not do anything which will tend to produce an excessive flow of Asphalt into his lot.

44. LA BREA SURVEY ORDINANCE.—This legislation came into operation on 11th July, 1905, and was designed in order to give powers to a surveyor, to make a plan of the asphalt area at La Brea, which had been the cause of so much litigation.

The Bill requires every land-owner, either to supply a plan of his property, or to fix his boundaries on the ground. The Bill also requires the Surveyor to fix and establish marks in solid ground, and to locate by triangulation or accurate survey such fixed marks, and to lay down on the plan the bearings, cross-bearings, &c., of the streets and property. The plan when made to be published for three months and finally laid before the Legislative Council, after which it will become the authentic plan of this locality.

45. MINES ORDINANCE.—This Ordinance (now under consideration) is designed to regulate the safe working of all mines, borings and quarries. It provides powers to inspect the works enumerated for the appointment of Managers to take charge of all mines, borings and quarries, and further requires the Manager of a mine to be certificated. It provides also for notification of the opening and closing of such works, the supplying of statement of the quantity of mineral extracted, and of the accidents occurring therein. It further gives powers for the making of regulation for the safe working of each of the industries referred to.

46. FACTORY ORDINANCE.—This Ordinance is now under consideration, and is drafted with a view to the safe working of Factories and the machinery and boilers contained therein.

47. PERSONS EMPLOYED.—The following tables have been compiled, through the courtesy of the owners, and may be taken as a rough estimate of the number of persons employed. The figures do not include the persons employed at many of the smaller works.

Number of persons Employed.

1904.

Name of Mineral.	Above Ground.		Below Ground.		Total.
	Males.	Females.	Males.	Females.	
Asphalt	729	52	..	..	781
Manjak	31	...	70	...	101
Quarries	323	66	...	...	389
	1,083	118	70		1,271

1905.

Name of Mineral.	Above Ground.		Below Ground.		Total.
	Males.	Females.	Males.	Females.	
Asphalt	823	49	...	...	872
Manjak	14	...	31	...	45
Quarries	358	86	...	...	444
	1,195	135	31		1,361

48. The following tables are obtained through the courtesy of the owners :—

Quantity and Value of Minerals produced during the years ending December, 1903, 1904, and 1905.

Mineral.	1903.		1904.		1905.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£
Asphalt—(Crude)	169,813	169,813	118,432	118,432	78,518	78,518
„ (Epurée)	(10,045)	...	(10,887)	...	(14,815)	
(Epurée equivalent to Crude) ...	20,090	20,090	21,774	21,774	29,630	29,630
Asphalt—Dried	(2,484)	...	(3,722)	...	(7,245)	
(Dried equivalent to Crude) ...	3,312	3,312	4,963	4,963	9,660	9,660
Total Asphalt ...	193,215	193,215	145,169	145,169	117,808	117,808
Manjak	587	880	3,023	4,534	1,077	1,615
Limestone and Road Material ...	31,513	3,885	36,107	3,984	37,423	4,000
Oil	...	...	...	...	80 galls.	
Total	225,315	197,980	184,299	153,687	156,308	123,423

49. I herewith append a list of mines, openworks, borings, quarries, and factories, which has been compiled from information supplied by the Wardens.

I have the honour to be, Sir,

Your most obedient Servant,

JOHN CADMAN,
Inspector of Mines.

The Honourable
The Colonial Secretary.

LIST OF MINES AND OPEN WORKS.

No.	Name.	Situation.	Owner and Address.	Manager.	Persons Employed.	Mineral Worked.	Remarks.
1	Vista Bella	San Fernando ...	The Vista Bella Manjak Company, Port-of-Spain ...	J. T. Raspass, C.C.M. ..	...	Manjak ...	Underground working.
2	Marbella No. 1 ..	San Fernando ...	The Marbella Manjak Company, Port-of-Spain ...	J. Waddell	..	,, ...	,, ,,
3	Marbella No. 2 ..	San Fernando ...	,, ,, ,, ...	J. Waddell	...	,, ...	Sinking.
4	Cunapo	Sangre Grande ...	The Government	C. Wilson	...	Coal ...	Underground.
5	Pitch Lake	La Brea	The New Trinidad Lake Asphalt Company, Limited, Brighton.	F. R. Bartlett, General Agent	...	Asphalt ...	Open work.
6	Pitch Lake	La Brea	Charles F. Stollmeyer, Esq., Richmond Street, Port-of-Spain.	J. Briggs	...	,, ...	,,
7	La Brea	La Brea	Messrs. Ambard and Protheroe, Port-of-Spain ...	R. Fitzallen	...	,, ...	Open work, steam pump used.
8	La Brea	La Brea	The New Trinidad Lake Asphalt Company, Limited, Brighton.	N. B. Smith	...	,, ...	,, ,,
9	La Brea	La Brea	The Heirs of Dundonald—Agents, Messrs. Gordon, Grant & Company, Port-of-Spain.	...	...	,, ...	,, ,,
10	Verdant Vale ...	Arima	The Trinidad Cocoa and Coffee Company	...	...	Gold ..	Sinking.
11	Glance Pitch Mine ..	Near Mayo Main Road ...	Messrs. Gordon, Grant & Co., Port-of-Spain ...	...	..	Asphalt ..	Not working.
12	Piparo Coal Mine ..	Piparo Settlement ...	H. J. Strong, Esq., Piparo Settlement	...	...	Coal ..	,,
13	Crown Reserve ...	Pasqual Road, Piparo Settlement	The Government	...	...	Liquid Pitch ...	,,

LIST OF QUARRIES.

No.	Name.	Situation.	Owner and Address.	Manager.	Persons Employed.	Mineral Worked.	Remarks.
1	Laventille, East ...	Champs Fleur ...	The Government	...	...	Limestone ..	
2	,, West ..	St. Joseph Road ...	,, ...	...	...	,, ...	
3	,, West ...	La Peña Valley ...	Heirs of Prizgar—R. M. T. Prizgar, Esq., Port-of-Spain.	...	..	,, ...	
4	Aricagua	St. Ann's Ward, Champs Fleur.	The Government—Hon. Director Public Works ...	...	...	Stone ...	
5	Cimaronero	St. Ann's Ward, Champs Fleur.	,, ,, ,, ..	...	...	,, ...	
6	St. Ann's	St. Ann's	Heirs of Prizgar—R. M. T. Prizgar, Esq., Port-of-Spain.	...	...	,, ..	

LIST OF QUARRIES.—*Continued.*

No.	Name.	Situation.	Owner and Address.	Manager.	Persons Employed.	Mineral Worked.	Remarks.
7	Santa Cruz	Gasparillo	J. E. Coryat, Esq., Port-of-Spain			Stone	
8	,,	Cangrigal	C. F. Stollmeyer, Esq., Port-of-Spain			,,	
9	,,	Gasparillo	E. Lange, Esq.			,,	
10	Carenage	Point Sinnett	Charles Lambert, Esq., St. Pierre			,,	
11	,,	Tucker Valley	Trinidad Land and Finance Company, Limited, Port-of-Spain.			,,	
12	,,	Point Cumana	M. E. Gillegean, Esq., Port-of-Spain			,,	
13	Maraval	Maraval, Perseverance Estate	J. J. de Boissière, Esq., Port-of-Spain			,,	
14	Mucurapo	Boissière Village	Heirs of J. J. de Boissière, Esq., Port-of-Spain			,,	
15	Diego Martin	Green Hill	Teresa Dolly, Diego Martin			,,	
16	,,	,,	A. Samuel, Esq., Diego Martin			,,	
17	Joseph Cooper	Indian Walk	Heirs of Joseph, Esq.			,,	
18	Dunmore Hill	Dunmore Hill					
19	Jackson's	Monkey Town				,,	
20	Jack Ayers	Henderson Road	Jack Ayers, Esq., Savana Grande			,,	
21	Mayo Government Quarry	Near Mayo Main Road	The Government			Road metal	
22	Morne Roche	Between Mayo and Coolie Town.	,,			,,	
23	Morichal	Morichal Local Road	,,			,,	
24	Atagual (2)	Guaracara-Tabaquite Road	,,			,,	
25	Piparo	Piparo Local Road	,,			,,	
26	Guaracara	Guaracara Main Road	,,			Stone	
27	Tabaquite	Tabaquite-Mayaro Road	,,			,,	
28	Brasso	Brasso Road	,,			,,	
29	,,	Crown Reserve	,,			,,	
30	Knox	Corosal-Maraval Road	Mrs. Knox, La Concordia Estate			,,	
31	Perry	Guaracara-Tabaquite Road	Mrs. William Perry, Tabaquite			,,	
32	La Coulée	San Fernando	Mrs. Oliviera			,,	
33	Bijou Cottage Quarry	,,	Dr. Eakin, Port-of-Spain			,,	
34	Glendale	,,	H. R. McLean, Esq.			,,	
35	Mon Nid	,,	Major R. Johnstone			,,	
36	Circular Road	,,	Heirs of Smith			,,	
37	Circular Road	,,	Borough Council			,,	
38	Plum Road Quarry	Plum Road, Nariva	The Government—Public Works Department			Road metal	
39	Upper Cunapo Quarry	Upper Cunapo	,, ,, ,,			Stone	
40		Mochel Poorie—Talparo Extension Road, Upper Caroni.	,, ,, ,,			,,	
41	Lapeyrouse	Arima	H. de Lapeyrouse, Esq., Mount Pleasant Estate, Arima			,,	
42	Diego Martin	River Estate	The Government—Hon. Director of Public Works			,,	
43	,,	Sierra Leone Village	Joseph Stewart, Esq., Diego Martin			,,	
44	,,	,, ,,	D. Superville, Esq., Diego Martin			,,	
45	,,	Petit Valley	Caroline Gonzales, Port-of-Spain			,,	
46	Chaguaramas	Carreras Island	The Government—Superintendent of Prisons, Royal Gaol, Port-of-Spain.			,,	
47	,,	Gasparillo	F. Herrera, Esq., Port-of-Spain			,,	

LIST OF FACTORIES.

No.	Name.	Situation.	Owner and Address.	Manager.	Persons Employed.	Kind of Factory.	Remarks.
1	Brechin Castle	Savanetta, California	The Trinidad Estate Company—W. G. Kay, Esq., (Attorney), Caroni Estate.			Sugar.	
2	Esperanza	,, ,,	Messrs. Henderson and Connell, Esperanza, California.	J. H. Connell, Esq.		,,	
3	Forres Park	,, ,,	The New Colonial Company, Limited, Port-of-Spain			,,	
4	Waterloo	Carapichaima	Adam Smith, Esq., (Trustee), Port-of-Spain			,,	
5	Woodford Lodge	Chaguanas	Hon. Samuel Henderson, Port-of-Spain			,,	
6	Enterprise	,,	J. Cox-Fillian, Esq., (Dominica)			,,	
7	St. Charles	,,	Heirs of John Hoadley, Esq., Port-of-Spain			Concentrated Lime-juice, & cocoa-drying	
8	Cunupia Saw-mill	Cunupia	G. Macnair, Esq., Cunupia			Saw-mill	Not working.
9	Usine, St. Madeleine	San Fernando	The New Colonial Company, Limited, London			Sugar.	
10	Palmiste, Usine	,,	Norman Lamont, Esq., London			,,	
11	La Fortuna	,,	Sir Charles Tennant, London			,,	
12	Bronte, Usine	,,	Messrs. Arbuthnot Lathon & Company			,,	
13	St. Joseph	Mayaro	Louise Ganteanne, St. Joseph Estate, Mayaro			Coconut Oil.	
14	Perseverance	,,	John Urich, Esq.	Paul Urich, Perseverance Estate, Mayaro		,,	
15	,,	Cedros	D. Kemp-Welch, Esq., London. Agent—Hon. S. Henderson, Port-of-Spain.			Sugar.	
16	St. Marie	,,	W. Greig, Esq., Cedros			Coconut Oil.	
17	L'Eenvieuse	,,	E. Nivet, Esq., Cedros			,,	
18	St. Quintin	,,	A. Kernahan, Esq., Cedros			,,	
19	Constance	,,	F. Agostini, Esq., Cedros			,,	
20	Reform	Reform, Naparima	William Sanderson, Esq., Reform Estate, Naparima			Sugar.	
21	Malgré-Tout	Princes Town	Messrs. C. Tennant, Sons & Company, Agency, San Fernando.			,,	
22	Buen Intento	,,	Messrs. C. Tennant, Sons & Company, Agency, San Fernando.			,,	
23	Craignish	,,	George Liddlelow, Esq., Craignish Estate, Princes Town			,,	
24	Hindustan	Near Princes Town	W. S. Robertson & Co., San Fernando			,,	
25	Mon Désir	Oropuche	W. Sanderson, Esq., Reform Estate, Naparima			,,	
26	Brighton	La Brea	New Trinidad Lake Asphalt Company, Limited, Brighton, La Brea.			Asphalt refining.	
27	La Brea	,,	C. F. Stollmeyer, Esq., Richmond Street, Port-of-Spain.			,, ,,	
28	Cocoa-drying Machine		Mrs. Murray	J. E. Lickfold, Esq., Sangre Grande.		Cocoa.	
29	Orange Grove	Tacarigua	L. Bert de Lamare, Esq., Orange Grove, Estate, Tacarigua.			Sugar.	
30	Caroni	Caroni	The Trinidad Estates Company—W. G. Kay, Esq., (Attorney), Caroni Estate, Caroni,			,,	
31	Mon Jaloux	,,	Messrs. J. F. and C. Schwann—Hon. S. Henderson (Attorney), Port-of-Spain.			,,	

LIST OF FACTORIES.—*Continued.*

No.	Name.	Situation.	Owner and Address.	Manager.	Persons Employed.	Kind of Factory.	Remarks.
32	Waterworks ...	St. Joseph and Tunapuna.	The Government—T. H. Warner, Esq. (Chairman) of Maintenance Authority, Warden's Office, Tunapuna				
33	Orange Hill ...	Calder Hall ...	J. A. Ward, Esq., (Receiver), Calder Hall, Tobago ...	...	..	Sugar.	
34	Auchenskeoch	Calder Hall ...	J. A. Ward, Esq., (Receiver), Calder Hall, Tobago ..	...	...	,,	
35	Smithfield ...	Smithfield ...	W. S. Ward, Esq., Smithfield, Tobago	...	...	,,	
36	Cradley ...	Cradley ...	J. R. D. Punnett, Cradley, Tobago	...	...	,,	
37	The Whim ...	St. David's ...	Benjamin Lees, Esq., The Whim, Tobago	..	...	,,	
38	St. Mary's Hill	Scarborough ...	M. B. Crooks, Esq., Scarborough, Tobago ...	...	...	,,	
39	Courland ...	Calder Hall ...	Mrs. J. H. Ward and Others, Calder Hall, Tobago . .	...	...	,,	
40	Golden Grove	Golden Grove	Dr. G. L. Latour, Golden Grove, Tobago ...	...	...	Cotton.	
41	St. Marie, Usine	St. Patrick's ...	W. S. Kernahan, Esq., Port-of-Spain, Trinidad ...	...	...	Sugar.	
42	Indian Walk...	Rockey Vale	Geo. R. Agard, Esq., Rockey Vale, Tobago ...	...	...	,,	
43	Woodlands ...	Scarborough ...	James E. Roberts, Esq., Scarborough, Tobago ...	...			
44	La Florisante	Dabadie ...	F. J. Le Blanc, Esq., Dabadie	...	...	,,	
45	Ice Factory ...	Arima ...	Mr. Doru, Arima	...	...	Ice.	
46	Soda Factory...	Arima ...	H. de Nobriga, Esq., Arima	...	...	Soda.	
47	Soda Factory	Arima ...	Kong, Esq., Arima	...	...	,,	
48	Soda Factory...	Arima ..	Bedes Buxoo, Esq., Arima	...	...	,,	
49	Diego Martin	Diego Martin	Water and Sewerage Department—E. V. Acton, Esq., (Engineer)	..	...	Waterworks.	
50	Maraval ...	Maraval ...	Water and Sewerage Department, E. V. Acton, Esq.	...	...	,,	
51	Mucurapo ...	St. James ...	Water and Sewerage Department, E. V. Acton, Esq.	...	..	Sewerage.	
52	San Fernando	San Fernando	Water and Sewerage Department, E. V. Acton, Esq.	...	...	Waterworks.	
53	Ice Factory ...	Port-of-Spain	Trinidad Shipping and Trading Co., Port-of-Spain ...	...	..	Ice.	
54	Ice Factory ...	Port-of-Spain	Ellis Grell & Co., Port-of-Spain	...	...	Ice.	
55	East End Foundry	Port-of-Spain	Messrs. Peet & Sons, Port-of-Spain	...	...	Foundry.	
56	Trinidad Foundry	Port-of-Spain	Ellis Grell & Co., Port-of-Spain	..	...	,,	