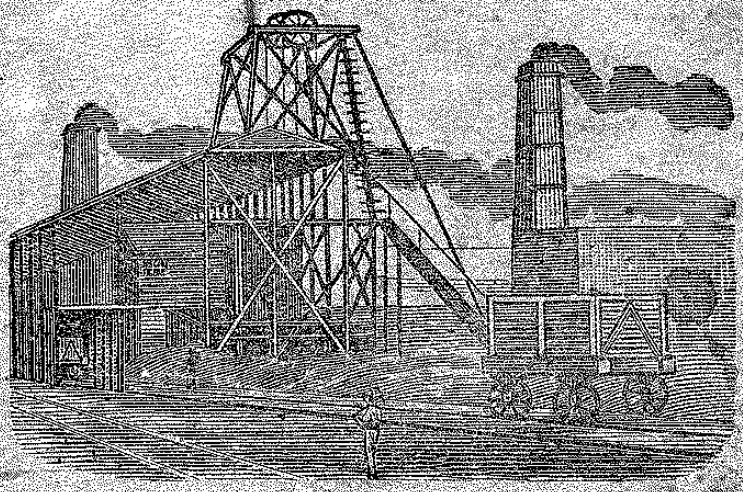
THE COAL MINES

OF

NEWCASTLE, N.S.W.

THEIR RISE AND PROGRESS.



BY

GEORGE H. KINGSWELL,

(ATRAMENTOUS.)

Newcastle, N.S.W.:

PRINTED AT THE "HERALD" OFFICE, BOLTON STREET.

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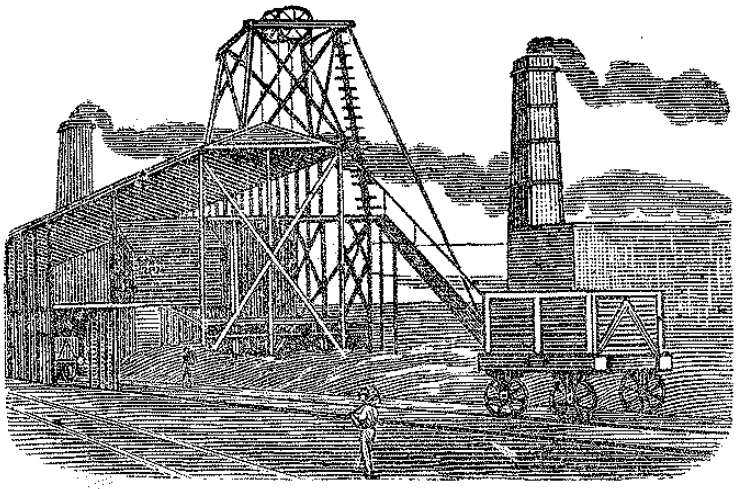

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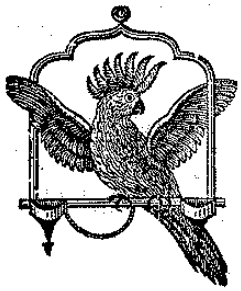

PREFACE.

THIS work, dealing with the collieries of the Newcastle district, is the republication of a series of articles written within the last few months for the columns of the *Newcastle Morning Herald and Miners' Advocate,* a paper that has grown with the coal industry, from a small beginning to a place of high importance, and the proprietors of which I have to thank for permitting me to use the matter collected for them. I have also been given great assistance by the several colliery managers, to whom I also tender my best thanks. My endeavour has been to give within a short space a concise history of the rise, progress, and present position of the working collieries of the district, and also some account of the numerous new collieries which the increasing popularity of Newcastle coal in Australia, America, and elsewhere has induced our capitalists to open up. The book altogether will give some idea of the great extent of an industry which, within a generation, has grown from almost nothing to one giving employment to many thousands of men, and has settled within a few miles of Newcastle a population of some 70,000 persons. As such, it requires no apology from me; and, again expressing my thanks to the proprietors of the *Newcastle Morning Herald,* I place it in the hands of the public.

G. H. KINGSWELL.

Newcastle, 1st December, 1889.

THE

COAL MINES OF NEWCASTLE;

THEIR RISE AND PROGRESS.

INTRODUCTION.

THERE can be very little doubt that coal was the first mineral discovered after the settlement of New South Wales, but the several accounts given of that important event differ both as to date and locality. According to some authorities the discovery was made in 1796, while others fix the date in 1797. Again, some say that coal was first found in a bay near Port Stephens, probably Newcastle Harbour; while others maintain that it was found in a cliff about 20 miles south of Port Solander. It is not, however, a matter of great importance where or when it was found; so suffice it to say that, at the present time, the known extent of coal measures within the Colony is nearly 24,000 square miles. By far the largest and most important part of these immense deposits at present being worked are situated within 32 miles of the city of Newcastle, the trade of which is second to that only of Sydney.

During the first thirty or forty years of the present century very little was done towards developing this branch of mineral wealth. The only mine opened up to 1817 was the property of the Government, and was worked by convict labour, near the south headland of the Newcastle Harbour. Prior to 1829 only some 50,000 tons had been raised, the Government supplying ships at 10s. per ton. In that year the Australian Agricultural Company took over the Government coal mines in the Newcastle district, and until 1847 they had a practical monopoly. At that time Newcastle was a penal settlement; but, in 1840, the A. A. Company sent coal miners from England to work their colliery. The annual output for the whole district, which was only 780 tons in 1829, was 30,256 in 1840, and from that date the progress has been remarkable, as the following figures will show:—1850, 11,216 tons; 1855, 117,076; 1860, 283,836; 1865, 306,578; 1870, 565,855; while in 1880 it exceeded 1,000,000 tons. In 1887 2,243 792 tons, valued at £1,096,720, were raised in the Newcastle district; while in 1888 there was a decrease of 176,749 tons, a result which was due to a general strike among the miners. This year (1889) the output will exceed 2,250,000 tons. At the

present time 6,873 men are directly employed in the forty mines which are in actual work in the Northern district. The present average price of Newcastle coal is 9s. 10d. per ton, and results show it to be equal for all purposes to the best English mineral.

The coal measures are divided into four groups, namely: the Newcastle series, Greta series, Tomago and East Maitland series, and the Lepidodendron or Stroud series. Only the first two have been as yet worked in the Northern district, the Newcastle series containing several seams, the principal one being the Borehole or Wallsend. This famous seam, which is worked in nearly all the collieries, contains a fine bright bituminous coal of first-class quality for gas, steam, household, and smelting purposes. Its maximum thickness is 22ft. 3in., and the average about 6ft. Its extent is not known, and it is probable that the measures exist at a great depth even as far south as Sydney. The No. 2 or Burwood seam has so far proved the next best of the series, but at present it is very little worked. Three more seams overlying the two former have been found near Lake Macquarie, and there is little doubt that others exist below them. A small quantity of inflammable gas exudes from the Borehole seam at some of the collieries, but with care when first found it is easily contended with. Naked lights are used in all the mines, and so far no serious explosion has occurred.

The Greta series commence some 35 miles to the west of Newcastle, and have been traced to Maitland, where several colleries are at present sinking to its seams. They have been proved to extend over a large area of country, estimated at 30 miles wide by 20 miles long, but they are as yet undeveloped. The No. 1 Greta seam ranges in thickness from 20ft. to 6ft, but it has only been opened a few years. Its coal has already attained a world-wide reputation for gas purposes. Other seams, including a deposit of cannel coal, exists in this group, but nothing is as yet known of them.

The facilities for shipping coal at Newcastle are excellent, and compare with any port of similar size in the world. The Carrington, or Bullock Island Dyke is over two miles long, and it is here that nearly all the ships are loaded. At present there are twelve hydraulic and three 15-ton steam cranes, belonging to the Government, capable of loading 12,000 tons per diem. Besides these there are six private shoots, from which another 3,000 tons can be put on board ships within 24 hours.

The miners of the district are banded together in an Association, every colliery having a lodge of its own, while questions of moment are discussed and debated in open conference with the Masters' Association, which includes nearly all the principal coal companies. The district price paid for hewing coal is 4s. 2d. per ton, the miners filling the small at 1s. 6d. per ton.

The Australian Agricultural Company.

THE Australian Agricultural Company, which at the present time have the second largest out-put of coal in the southern hemisphere, was formed in November, 1824, in London, for the purpose of taking up land in the Australian colonies.

The early history of the company shows that in December, 1829, the Government coal works became their property under singular circumstances. The prospectus of the company, dated November 26th, 1824, set forth that the sources of profit were to be wool, cattle and live stock, tobacco, silk, olive oil, wine, opium, flax, and the general increase of values by influx of population. The capital was one million sterling, in 10,000 shares of £100 each. Earl Bathurst granted the company one million acres in fee simple between the Hastings and the Coal River (now known as the Hunter). The first meeting took place in January, 1825, at which Mr. Robert Dawson was appointed the company's agent, with a committee of five Sydney residents to direct him, and with him came agriculturalists, sericultura'ists and vine-dressers. Large establishments were built at Stroud and Gloucester, but from droughts and seasons of depression in colonial trade the company saw little or no dividends. The company soon discovered that Mr. Dawson had made a mistake in his flourishing account of the country behind Port Stephens, and that the Newcastle coal field presented a good opening for investment In 1829-33 Sir Edward Parry, the company's agent, succeeded, after some demur from the Colonial Government, in abandoning the scrub land about Port Stephens, retaining merely 464,600 acres, and occupying a richer, and more open country at the head of the Namoi and Mooki, hence the origin of the Peel River and Warrah estates granted by Lord Goderich, because the company had spent £250,000 in eight years in the colony. With respect to the coal-works of Newcastle, the company obtained a grant of 1,960 acres in access of the promised million and a monopoly, or rather a lease, of the coal trade for thirty-one years, subject to the following conditions: One-twentieth of the coal raised to be allotted to the Crown; the company to purchase the coal, or any part of it, at the pits's mouth at the market price, provided the Crown deemed it advisable to sell the same to them; and, further, one-fifteenth to be reserved by the Crown. In 1831 Sir Edward Parry reported that two shafts were sunk, an adit driven, a steam-engine erected, and a wharf 13ft above high-water mark, at which vessels could load. In 1840 the company sent miners from England to work their mines. Captain King, their commissioner, wrote that there

were between two and three thousand tons of shipping in Newcastle harbour waiting for coals. As showing the rapidity with which the coal trade grew, the quantity and value of coal raised between the years 1830 and 1843 was 239,328 tons, valued at £135,090. Notwithstanding the company's contention that they held the exclusive right to mine for coal in the colony for a period of thirty-one years from 1829, the Rev. Mr. Threlkeld opened a colliery in 1841 or 1842 on his property at Lake Macquarie, and within a few years later several mines were commenced by Messrs. Brown, Turner, Eales and others in the Newcastle district. In 1847, with the concurrence of the company, the monoply was terminated, and in 1851 the Supreme Court decided that it was quite illegal from the outset. From that date coal-mine operations exhibit a rapid increase, and the coal trade has become one of the most important industries in the colony. Indeed, it was not until 1849 that the item of coals was for the first time deemed of sufficient importance to have a table assigned to it in the annual statistics of the colony. In that year it was shown that six coal mines had been worked, producing 48,416 tons, of the declared value of £14,647.

The present capital of this great company is £500,000, in 20,000 shares of £25 each, as part of its grant was taken by a separate company, and some idea of its rapid development may be had from the fact that the present price of the shares on the London Stock Exchange is often as high as £100. Previous to the year 1855 when the railway was opened, the coal trade of this district was almost monopolised by the company, the only other mines being those of Messrs. Brown, Donaldson, and Nott. The coal raised from the mines owned by these gentlemen was brought to the port in drays, but when the Maitland line was opened they erected shocts adjoining those of the A. A. Company. At the present time the company rank next to Wallsend in the output of coal, raising for the five weeks ending September 28, 1889, the large quantity of 30,760 tons. Last year 270,976 tons were taken from their three mines, but owing to the strike they were lying idle for three months of the time. There are at present three working pits, namely, No. 2 or the Borehole, the Hamilton mine, and the New Winning shaft, better known as the Sea Pit. The three mines are capable of putting out, when in full working order, over 400,000 tons of coal per annum, and the output for the present year is expected to be over 300,000 tons. Owing to the late lamentable accident in the Hamilton pit the output has been in a measure decreased, as only some twelve pairs of men, in place of over fifty, are now at work in that mine. The No. 2 and Hamilton pits are, properly speaking, one colliery, as their workings run into each other. They are about 200 feet deep, and the former is one of the oldest pits in the district, having hundreds of acres or

goaf or worked-out land. They are situated about two miles from the city, and are connected with the harbour by a private railway, leading to the private wharf. The New or Sea Pit is close to the city, and is 260 feet deep. It is undoubtedly one of the finest mines in the colonies, and is a separate and distinct colliery from the others, a barrier of five chaine being left between its workings and those of the Old Borehole. The seam wrought in all the pits is well known as the Borehole seam, and varies from 12ft to 18ft in thickness, lying very regular and free from faults. The mines are situated on the company's estate of 2000 acres, and notwithstanding the large amount of coal already won from the land there is still sufficient to keep the pits going for many years. The company have also obtained the right to mine from the new pit an area of four square miles under the ocean, and therefore this mine will not be exhausted for nearly a century to come. Great care has been taken in opening it out, and at present headings are well forward of the working places, while extra heavy pillars have been left on the main ways, in view of the length of time they will have to stand. At the present time the company employ 790 men underground and 160 on the surface. The plant and machinery at the three mines are all of the most improved type, the pumps being worked by compressed air or by steam sent down from engines on the surface. The heaviest pump is at the new mine, and is capable of lifting 40,000 gallons of water per hour. The ventilation of the pits is stated by the miners to be excellent, the old ones being supplied by means of a 30-foot diameter Guibal fan, which produces from 90,000 to 100,000 cubic feet of air per minute. At the Sea Pit ventilation is given by a 13-feet 6-inch "Schiele" fan, which is, like the first, placed at an upcast shaft, and acts by suction upon the air which passes down the working or downcast shaft. It is the largest in the colonies, and is capable of throwing nearly 300,000 cubic feet of air per minute. The total engine power employed at the old pits is equal to 790 horse-power, while at the new mine it is 390. The underground hauling of the skips is effected by an engine placed at the surface of each shaft, the endless wire rope passing round the engine drum, then going down the pit along the main engine plane to a large wheel at the end. The friction and wear upon the rope is eased by numbers of small steel road rollers, while the object attained by placing the engine on the surface is the prevention of the damage to the air by the exhaust steam. The screening apparatus at the old pits are the ordinary range of sloping parallel iron bars about 7-8ths of an inch apart, the small coal dropping through and the larger passing over on to the waggons. At the new pit the arrangement is entirely different from any in the district, the coal as it comes from the shaft being tipped upon a sloping iron network shaker which separates the small. The

round or large coal then passes down an iron shoot and is delivered upon a broad iron travelling belt which is always slowly moving. While upon this belt and travelling horizontally for a distance of 50 or 60 feet ample opportunity is given for the sorting and removing of any refuse in the coal before it reaches the waggons below.

The arrangements for the shipment of the A.A. Company's coal are excellent, all the collieries being connected by rail with three staiths on the company's own wharf. The depth of water is 18ft at low tide, and intercolonial steamers of 2500 tons burden are frequently loaded at the shoots. To enable the large sailing vessels to be loaded the company have recently dredged the basin near their wharf, and at the present time the largest vessels can without danger lay alongsde. One new staith is being constructed, while one of the others has been in use for some time upon a high level, so as to meet the increased size of steamers and vessels now carrying coal. The coal is drawn up an inclined plane to the high levels by a stationary engine, and each of the staiths has a high or low shoot to suit large or small vessels, as the case may be. Each staith is capable of loading 2000 tons per day of 24 hours, and the wharf is so arranged that a steamer can load coal into one hatch from the high level and discharge cargo from another hatch at the low level at one and the same time. There is also communication from all the pits to the Government cranes at Bullock Island. The waggons used are all steel hoppers, and are 320 in number, having an aggregate capacity of 2600 tons, and are hauled by two of Beyer's and Peacock's locomotives.

For many years the trade of the A.A. Company has been chiefly confined to the colonies, but of late attention has been drawn to the excellent markets in America, India, and other places. In March last a trial shipment was sent to the San Francisco gas works, and was very favourably reported on, and it is quite on the cards that the Wallsend and Greta will soon have to share the American trade with the A.A. Company, Stockton, and others. An average analysis of the company's coal shows that it contains only 5.35 per cent. of ash and clinker, a result which is much under many of the other collieries in the district. There is 63.28 per cent. of coke, and its specific gravity is 1.297.

The company is superintended in the colonies by Mr. Jesse Gregson, Mr. William Turnbull being manager of the collieries, Mr. John Gammack, accountant and wharf agent. The company forms one of the parties to the Northern Collieries Association, and when in conference with the miners the superintendent acts as the chairman.

The company possess an immense tract of country at port Stephens, a few miles north of Newcastle, where a coal seam of

20 or 30 feet in thickness is known to exist, but as it lies at a considerable angle it is an open question what its commercial value is. Iron-stone and limestone also exist in immense quantities, and there is no doubt that in time to come they will be turned to account.

Newcastle-Wallsend Coal Company.

DURING the year 1860 the now famous Newcastle-Wallsend Company, whose colliery is the largest in the Southern Hemisphere commenced operations on some seven or eight hundred acres of land to the southward of the present town of Wallsend, about eight and a half miles from the port of Newcastle. The capital of the company was £100,000 in 10,000 shares of £10 each, and for some years after it was formed its path was beset with innumerable difficulties and impediments. During the first year of its existence a general strike took place among the miners of the district, but, notwithstanding this, the output of the company reached 43,273 tons. In 1862, that amount was increased to 124,218 tons, from the three pits now known as A. B. and C. In the meantime the company succeeded in purchasing the well-known Weller's grant of 8,000 acres, thus increasing their estate to nearly 9,000 acres. This immense parcel of land, which is the exclusive property of the company, extends from Cockle Creek to Hexham, and is the largest coal-mining estate in the colony. From the day the company secured that land it had a successful and rapid development, and the shares which at times were exceedingly low, increased in value, until at the present hour they are quoted at £46 each. Besides this a great portion of the paid-up capital has been returned. Soon after the commencement of the company they succeeded in obtaining from the Government the right to erect steam cranes on the Newcastle wharves. These were the first steam cranes erected for the shipment of coal in Newcastle. The Government subsequently erected others; but objections being raised by other Companies to the Wallsend Company having exclusive right to ship by the cranes erected by them, the Government purchased them at a valuation. At the present time the company have seven and a-half miles of haulage to the dyke, four miles of the railway being their own, and three the property of the Government, who haul the coal at a fixed standard price per ton In the year 1878 the company, wishing to increase their

output and develop another portion of their estate, drove No. 1 tunnel into the hill on the Newcastle side of Wallsend, and opened out the mine on such a scale as to enable them to increase their output until it was the largest of any colliery in Australia. The working by means of a tunnel proving advantageous, the company in 1884 opened out another and concentrated the works, ceasing to raise coal at B Pit, which is now used principally for pumping purposes. Should, however, increased trade render it necessary, work could be resumed with but little outlay or delay at B Pit.

A glance at the statistics of the company shows that in the year 1886 no less than 483,884 tons, valued at £240,000, were won, while in 1887 it stood at the enormous quantity of 491,498 tons, valued at £247,595. Last year, however, the output had decreased to 372,743 tons, but that result was due to the great strike which closed this and nearly all the collieries in the Newcastle district for three months. The two tunnels are capable, when in full and constant work, of sending out half a million tons annually, and despite the dull times the outlook for the present is exceedingly bright. For the six months ending June 30th, 257,378 tons were won, and the amount which is certainly enormous, exceeds all previous records, except 1887. For the five weeks ending September 28th, the amount raised was 39,883 tons, and there is every probability that at the end of the year the company's output will be over 400,000 tons. The number of men employed by the company underground is 1070, while 180 men and boys find employment on the surface. At the present time the innermost workings are one mile and a half from the mouth of the tunnel, but are still some five miles from the end of the estate.

The system of hauling out the full skips, and sending in the empty ones from the tunnel is so complete and on such a huge scale as to deserve a special article in itself. In place of the endless wire rope which obtains in the majority of the collieries in the district, the company have what is known as the tail rope system, by which forty skips in one train are continually being pulled out. Three powerful engines do the work of hauling from No. 1 tunnel, while at the other the work is accomplished by one, the aggregate power of the four being equal to over 1200 horses. The screening and loading the coal on to the waggons is, perhaps, one of the most interesting sights at the colliery, and when it is considered that over 2000 tons are treated every day, some idea of the work entailed may be formed. It may be stated, the colliery buildings are erected in a gully, and as the skips of coal are hauled from the tunnel, they are some 15 or 20 feet above the level of the railway when stopped in the screening-sheds. Here they are quickly capsized, the contents

rushing into the sloping iron bars which lead to the hopper waggons below. The bars are three quarters of an inch apart, thus allowing the small coal to run through, while the round or large coal passes over into the waggons. When one set is filled they are drawn away by a locomotive to the port, while another set takes its place under the screens. At the mouth of No. 1 tunnel there are eight of these screens, while five more suffice for No. 2. The small coal, when it is not in demand, is stored in a huge timber box-like structure, known to miners as a hopper, which is capable of holding 2000 tons. Owing to a recent arrangement entered into by the miners and the management, whereby the small coal is brought out of the pit in place of being deposited into the vacant places, the company are erecting a second hopper similar to the first.

Much attention is paid to the ventilation of the colliery, and many thousands of pounds have been spent to make it up to the requirements of the miners. The main source of supply is obtained by a Guibal fan 40ft. in diameter and 12ft. across, which is by far the largest in the colonies. For some years the A.A. Company had the only one of these ingenious contrivances in the district, but their efficiency is fast bringing them into common use. The fan at Wallsend is capable of supplying 200,000 cubic feet of air per minute, and is one of the sights of the colliery. Besides this, each tunnel is supplied with 100,000 cubic feet of air per minute by two furnaces placed at the mouth of air shafts. Very little fire-damp or sulphuretted hydrogen gas, it is understood, has ever been encoutered in the Wallsend mine, while the encroachment of black-damp, which invariably accumulates in old workings, is prevented by a free use of stoppings of brickwork over the entrances. A vast amount of coke is made in the ovens adjacent to the colliery, and a most complete system of electric signalling to all parts of the mine is most successfully carried on.

The trade of the Wallsend Company is chiefly foreign, a great amount of its coal going to California, where it has gained an enviable name. A large quantity is also sent annually to South America, India, and other places, where it is equally well-known. At the present time there are 630 steel hopper waggons, besides others, in use, having an aggregate capacity of 5700 tons. Among the intended improvements shortly to be made at this remarkable colliery is a pair of two thirty-inch cylinder engines to work on the first motion. They are now on the way from Britain, and on arrival will be placed at No. 1 tunnel for the purpose of increasing the speed in hauling out the loaded skips.

The seam worked in the colliery is the well-known Borehole, but is known in the vicinity as the Wallsend seam. It is about 8ft. in thickness and is very free from faults, lies regularly, and

dips about 1 in 60 south-west and south. The seam, however, is supposed to deteriorate as it extends south of the site of the tunnels, which by the way are known to some as the Dark Creek adits.

The works at the colliery were carried out from 1860 under the management of Mr. J. Y. Neilson until his death in May, 1889. Mr. Alexander Ross, Junr., who had been in the employ of the company from 1861 to 1878, when he was appointed as colliery manager of the Newcastle Coal-mining Company, succeeded Mr. Neilson as colliery manager, and entered on his duties in August, 1889. The head office of the company is in Sydney, Mr. F. W. Binney being secretary; the local office being under Mr. H. R. Cross, who acts as shipping manager.

Scottish-Australian Mining Company.

THE Scottish-Australian Mining Company, better known in the district under the name of Lambton, was formed in London in the year 1860 for the purpose of acquiring mineral property in the Australian colonies. The capital of this most important company is £160,000, in 160,000 shares of £1 each, with power at any time to increase the amount. At that time, the Lambton Estate was in the hands of Messrs. Morehead and Young, but shortly after its registration, the company took over the land. It consists of 1860 acres, and extends from the northern boundary of the township of Lambton to the Waratah Company's land, a distance of nearly three miles. The Newcastle-Wallsend Estate adjoins the western boundary, while the Commonage and the New Lambton Estate form the greater part of the eastern boundry: its undulating character and splendid situation must at no distant date make the surface extremely valuable for suburban residences. The company also possess a copper mine at Cadia, close to Orange, but some time ago they decided to cease the operations. Since the company's formation it has paid dividends of from 7 to 20 per cent., the shares at the present time being at a high premium.

In 1861 Mr. Thomas Croudace, the present colliery manager and engineer, arrived from England, and commenced the work of opening the mine. The site chosen was at the north-east end of the estate, and it was intended to tunnel into the seam which outcrops along the hills to the north of Lambton. For some

months, however, the coal was obtained from a shaft and in 1863 the out-put was 3361 tons. A tunnel, which has long since been abandoned, but is still used as a travelling road, was then driven into the hill in a westerly direction, and the output from this for some years was sufficient to meet the trade of the company. The colliery from that time shows a rapid development, the annual output for the five years ending 1870 averaging nearly 160,000 tons, while for the year 1867, 182,007, tons were won, a record which up to that date had not been equalled by any colliery in Australasia. Some years ago the company obtained the right from Government to mine the coal from 280 acres of the commonage, and for that purpose drove a second tunnel to the east. When this grant was worked out in 1884, steps were taken to drive a second and larger tunnel into the estate close to the first one, and it is from this drive that the company now draw their coal.

This tunnel enters the hill at a gradual incline for nearly three quarters of a mile, where four main banks or headings branch off at intervals to the south for various distances, the longest being about one mile and a-half. Another main heading goes nearly due west, and off this the north-western portion of the estate is being worked. These main-ways are beyond doubt the strongest and most secure of any colliery under inspection in the Northern district. Running the entire length of each and all of them are pilliars going from 20 to 30 yards in thickness, thus forming a solid barrier, only broken at long intervals by an entrance to a crosscut or working heading. Besides this the return airways and main headings are strongly timbered, so that no fall or crush can possibly extend over them. This is a precaution which needs no comment, and one which it is to be hoped will be followed in the new collieries about to be opened in the district. Pillars have been worked from immense portions of the Lambton mine, and although some of the falls have been extensive, yet no instance of those mainways being damaged in the slightest degree is on record. Off these main engine planes the coal is worked on the usual principle, with the exception that every bord is well "spragged," props being put in by the miner every two or three feet. In consequence of this rule accidents have been rare in the colliery, the manager priding himself, and justly too, on that fact.

The underground haulage obtaining in this mine is most complete, being accomplished by what is known as the "main rope system," the empties finding their way to the various flats or banks by gravitation. The main hauling or winding engine is placed at the mouth of the tunnel, and has control over the main drive; a distance of over half a mile. It is on the horizontal principle, geared three to one, and equal to 50 horse power. A

little over half a mile to the east are two other hauling engines placed at the surface of shafts, which go down to the end of the bank or flat where the other engine-rope stops. The first of these is 20 horse power, and the second 60, and their wire ropes run down the shafts along the southern main headings to the end. A fourth engine of 60 horse power is at the mouth of a shaft further eastward again, and this one does the hauling for the remaining workings. The total hauling distance is about a mile and three-quarters, but it will shortly be increased to over two miles. To better explain this system, we will suppose a train of 30 full skips have been put together by the horses at the end of No. 5 or at the most easterly engine plane. It is then some 3000 yards from the mouth of the tunnel. One of the wheelers, having fixed the wire rope to the foremost skip of the set, reaches above his head and gives the signal, and in a few seconds the train moves up the heading. On arrival at the end the rope is taken off, and the rope controlled by the main engine takes its place, and quickly drags the set up the half-mile tunnel on to the screening floor. When empty they are sent off, and by gravitation reach the end where they started from, their speed being of course regulated by the rope. The same thing takes place in the other main-ways, and so full and empty trains are constantly ascending and decending the mine. In case the strong wire rope, which runs on steel rollers placed every eight yards, should break, the train is prevented from rushing back by a drag fixed on the hindermost skip, which, in the event of such an occurrence, would throw the set from the rails, and so stop them. The wire rope used is made of steel, and is 2½ inches in circumference.

The ventilation of the Lambton colliery is effected by two furnaces, one of which, however, is very small. The other is at the bottom of a shaft 400ft. deep, and is capable of throwing 250,000 cubic feet of air per minute. It is one of the finest furnaces in the colony, being 26ft. in length and 10ft. in width, and is at present capable of drawing more air than required. On the occasion of a recent visit the air in the four return ways was measured, and it was fouud that nearly 180,000 cubic feet were passing up the shaft every minute. The workings are drained from what is known as the water or middle shaft, which is 220ft. deep, near the lower end of the workings. The water, owing to the natural dip of the seam to the south, finds its way to the bottom of this shaft, and is pumped up by a 21-inch cylinder Tangye pump, working at the bottom of the pit, but supplied with steam from 3 boilers 45ft. long by 5ft. 6in. in diameter, placed on the surface. A second very powerful pump is also to be erected at the mouth of what is known as the Mosquito shaft. The headings are now driven well forward of the

workings, and in a short time this new machinery will be wanted.

The work-shops and plant at the colliery may be said to be the chief attraction to a visitor, and are by many considered to be the neatest and best kept of any in the colony. The main building is of brick, and contains the engines, screening apparatus, and other requisites of a well-appointed coal mine. Close to it on the south side is a large two storey brick building, in the top floor of which is a complete sawmilling plant, including a large double self-feeding vertical saw. The timber is obtained from the estate—all woodwork required for the colliery being made on the premises. On the ground floor of the building are turning lathes and iron working machinery, the whole being driven by a powerful engine at the rear of the building. A large storeroom, where the numerous articles required for a colliery are kept, is a picture of cleanliness and good order, and adjoins the workshops, while a large stable, replete with every convenience, is close by. A blacksmith's shop is also in a separate building, while the offices and other premises are erected on the same model plan. In fact the colliery is the most complete in the district, and its buildings form a striking contrast to those of many of the other mines.

At the present time the mine is capable of putting out 1250 tons of coal per day, but lately the miners have not been working full time owing to the scarcity of shipping in Australian waters. When the demand for small coal is slack, it is stored in a large wooden hopper, which is capable of holding over 1000 tons; but the large coal, as at other collieries, goes from the screens into the railway waggons for immediate shipment. The output for the Lambton colliery for the half-year ending the 30th of June, 1889, was 139,579 tons, and for the quarter ending September 28th 65,204 tons. In 1887 167,355 tons were raised, and in 1888 164,048 tons. The record for the present year has just been made out, and it shows that 237,400 tons have been raised. When the company's new colliery at Durham is in full swing the total annual output will be very large. There are at present 453 men and boys working underground and 69 on the surface, making a total of 522 employed at the colliery.

The seam in the Lambton workings averages nearly 10ft. in thickness, and in some parts 8ft. is being worked, while in others the bottom is left, and the working is on 6ft. of splendid coal with only two small bands. It is very free from faults, lies regular at a dip of about one in forty south. Near the southerly end of the estate, however, the seam deteriorates, while in one part it has been thrown up, and in consequence it is improbable that it will be worked. There is, however, enough coal to keep the colliery in full swing for many years to come, and

at present the estate may be said to be only thoroughly opened out. An analysis of the coal shows that it contains only 4·51 per cent. of ash and 0·55 per cent. of sulphur. Its coke producing quality is large, being 64 per cent., while it is a very good gas coal.

The arrangements for taking the mineral to the port are excellent, the company having two miles and a half of private railway, which connects with the Government line two miles from the wharves. There are 300 steel hopper waggons in use, and Mr. Croudace complains bitterly of the damage done to them at the cranes during the process of unloading. The haulage from the colliery to the port is done by the Government engines at a fixed rate of 10d per ton.

The Lambton colliery has a large intercolonial trade, but the major portion of the mineral goes to India, Mauritius, and China. The head colonial office of the company is in Sydney, where Mr. A. Shannon, the general manager resides. Mr. Thomas Croudace is the colliery manager and engineer, and is ably assisted by his son, Mr. Frank Croudace. Mr. Thomas Muncaster is the shipping manager, the local office being in Scott street, from which there is telephone communication with the colliery. The company form one of the parties to the Associated Masters, being represented at the conferences by the general manager, Mr. A. Shannon. The company's new colliery, at present being opened on 3000 acres of land at Durham, is dealt with elsewhere.

The Co-operative Coal Mine.

PROBABLY no colliery in the Northern district has such an eventful history as the Co-operative Mine, which is situated in Plattsburg, the adjoining borough to Wallsend, some seven and a-half miles by rail from the Newcastle harbour As its name implies, it was originally held by a party of miners working in co-operation, and the early struggles of the men to insure prosperity for their venture are well worthy of a foremost place in the history of coal-mining in this colony. It was the first, and, so far as the district is concerned, the last attempt made to work a coal mine on the co-operative principle, and, although the party failed to carry out their plans, yet it was a praiseworthy enterprise, and one which is deserving of the sympathy of all unprejudiced persons. Had practical skill and patient industry

been the only attributes necessary to secure success, then the Co-operative would at the present time be in possession of the finest coal trade in the colony. Unfortunately the miners lacked capital, and the want of it crushed the venture before it can be said to have fairly sprung into life.

On the 25th November, 1861, James Fletcher, Alan Wylde, Hugh Walker, Samuel Fletcher, William Wonders, George Curliss, Thomas Alnwick, Robert Forrester, Richard Peeks, William Davis, Duncan Cherrie, William Bower, James Richardson, Matthew M'Claren, and James Nelson, all thoroughly practical miners then working in other collieries, entered into an agreement. Many of the above gentlemen are now in the district, where their names are well and favourably known. The document set forth that the parties had leased from Messrs. Kenrick, Kenrick, Brooks and Company, a parcel of land containing 1280 acres with the right to mine the coal underlying it at a royalty of 6d. per ton. The estate was at the head of Ironbark Creek, and between the present Wallsend Company's estate and the land belonging to the firm of J. and A. Brown. It was originally a Crown grant to Henry Cowper, Charles Cowper and George Miller, and the seam had been proved in the Wallsend colliery, which is some 90 chains to the eastward of the present Co-operative mine. Besides this the miners obtained some 320 acres of land then known as Brooks' farm, situated to the north-east of the former estate. The deed provided that the concern should be known as the New South Wales Co-operative Coal Company, with a capital of £30,000 divided in 6000 shares of £5 each. All the parties were bound to do their utmost to further the interests of the company, and the management was reposed in a board of directors, of which Mr. James Fletcher, now member for Newcastle, was chosen chairman, and Mr. Robert Bousfield, secretary. The capital and property of the company were looked upon as personal estate, and transmissable as such by the shareholders, but there was no benefit of survivorship among the parties. No legatees, next of kin, or *cestui que* trust, under the will of any deceased proprietor was to be recognised, the administrators or executors being considered the holders. Not more than eight shares were allotted to any one person during the first six months, and a deposit of five shillings per share was to be paid before execution. The capital could be increased under certain conditions and the shares issued to other persons outside those named at the discretion of the directors, who received 11s 4d and travelling expenses for every meeting they attended. There were numerous other rules, many of which, particularly relating to the payment of calls, were very stringent.

In 1862 a tunnel was driven into the outcrop of the seam near the present site of the colliery buildings, and for many years coal was hauled from this tunnel. It runs in a south-easterly direction following the seam at an inclination of about 1 in 40. The first coal mined by the company was taken in a cart to Ironbark Creek, and shipped on small barges. In 1863 the Wallsend Company completed their railway, and then the Co-operative miners, having made all arrangements constructed the present line, joining with the Wallsend at a point about 70 chains from the mine. Owing to the keen competition among the various coal companies, and the low price of coal then ruling, the young company had anything but a prosperous time of it, and many people in the district still remember how in those days the directors had often to allow the miners to go home without their wages on a pay-Saturday evening. In 1865 the output was 2442 tons; in 1866, 24,600; in 1867, 29,945; in 1868, 33,363; and in 1869, 34,717 tons. Many of the shareholders in the company refused to pay the calls on their shares, and the directors being at their wit's ends for money were forced to borrow at a high rate of interest. The price of coal was only between seven and eight shillings per ton, and in the year 1868 the shareholders realised that the co-operation had not been a success. The mortgagee in 1869 foreclosed on the property, and the concern became a thing of the past.

The colliery then passed into the hands of its present proprietor, Mr. William Laidley, who, having capital at his command, quickly raised the output to a high standard. Mr. James Fletcher for years after managed the mine, and in 1872 the output was 97,709 tons. From that year to the present time the colliery has had a successful career, and is at present one of the largest in the district. The major portion of the old estate is now nearly worked out, and in 1876 the proprietor obtained a forty years' mineral lease of the Wentworth estate, which adjoins the freehold land on the east. This estate contains 1238 acres, and extends from Wallsend to Minmi. A second tunnel was driven into the hill about half a mile to the south of the old one, and from this the coal was worked until recently. The full skips were drawn from the mouth of No. 2 tunnel to the screening shed by a wire rope; but a few months ago water got into the workings from the "goaf," and work was suspended for some time. A third tunnel was, however, nearly completed about another half a mile further to the south-east, and shortly after the flooding of No. 2 it was opened. It was made to lessen the underground haulage and develop another portion of the estate. The No. 2 tunnel is now lying idle, but as many acres of pillars still remain in the workings, work will be resumed there within a short time.

The new or No. 3 tunnel, is driven into the hill in a westerly direction for a distance of nearly three-quarters of a mile, when headings go off in every direction. The full skips are taken to the main engine planes by horses, and then attached to a wire rope controlled by a 45 horse-power engine placed at the mouth of the adit. When they reach daylight a second engine of 30 horse-power, which is placed near the first, supplies power to convey them over the surface for nearly half a mile, when the rope from the main engine at the screens, 60 chains further on, is attached to the train, which is drawn up to the screens over a mile distant from the mouth of the tunnel. The system is a marvellous one, and, although the hauling distance is great, it is mainly on the surface. A train of forty-five full skips, each containing from 12 to 14 hundredweight of coal, is hauled over a line of rail only 22 inches wide right from the workings underground to the screening sheds, a total distance of over a mile and a-half, by a thin steel wire rope controlled by three engines. Owing to the undulating nature of the ground, both a main and a tail rope are used to pull coal trains—in some places going at a furious rate, but always passing each other in the same spot. Upon arrival at the screening sheds the coal is tipped on to four common sloping parallel iron bar screens, the small going through and the large or round coal passing over on to the railway waggons beneath. The main colliery buildings are of common structure, no useless expense in embellishment having been entered into by the old company who first erected the plant. Close to them are forty-five Beehive coke ovens, which, when in full swing, can turn out 150 tons of coke per week. At present there are no buildings at the mouth of the new tunnel, but in a short time the engines will be covered by a large shed. The small coal when not in demand is stored in a hopper which has a capacity of 750 tons.

The workings are ventilated by two furnaces placed at the mouths of air shafts, 150 and 40ft. deep respectively. They draw about 130,000 cubic feet of air per minute through the mine, which is divided into six splits. When the workings are extended the furnaces will be worked to full power, when they are capable of greatly increasing their present supply of air. The mine is comparatively free from water, the workings at present being kept dry by a double lift dry rod pump placed at the mouth of a shaft 80ft. deep, and worked by a 15-horse-power engine. Owing to the dip of the seam the water finds its way to the bottom of the shaft by gravitation.

The seam at present being worked in the colliery is the well-known Borehole, or, as it is better known in the vicinity, the Wallsend seam. In the old tunnels the seam was 9ft. in thickness, including bands, but in the present workings it is 5ft. 9in.,

being a clean, bright coal, very free from impurities, and all workable. There are very few faults in the mine, the seam lying regularly at a dip of about 1 in 60 south. The system of working is similar to that obtaining in other collieries, the bords being 8yds. wide and the pillars 5yds. in thickness. An analysis of the coal gives the following results:—Moisture 2·45 per cent., volatile hydro-carbons 34·38, fixed carbon 58·24, ash 4·20, sulphur 0.73, the specific gravity being 1·310, and the percentage of coke equal to 62·44 of the whole.

In 1886 the output of the colliery was 240,274 tons, 1887 224,225, and last year, despite the strike, 172,256 tons were raised. During the past five years its output has only been exceeded by two collieries; but owing to the works being flooded in the month of July and part of August, the output for the present year has been greatly reduced. During the half-year ending June 30th last, 90,534 tons were raised, and for the quarter ending the 28th of September, 1889, the output was 21,115 tons. When in full swing the colliery is capable of putting out 1000 tons of round and 250 tons of small coal per diem, and is at present working very steadily. The mine gives employment to 310 miners, 110 shiftmen and underground hands, and 93 others on the surface—a total of 513 employees. At the present time there are seventy-four horses constantly at work in the colliery.

The trade of the Co-operative Colliery is largely intercolonial, the major portion of the coal going to Victoria and South Australia; while the remainder is distributed in the other colonies and foreign ports. The shipping arrangements are excellent, the proprietor having three-quarters of a mile of private railway joining with the Wallsend Company's line, the total distance to the ship's side being seven and a-half miles. There are 229 steel hopper and wooden waggons in daily use, the Government hauling the coal to the port at a fixed rate.

The proprietor forms one of the parties to the Masters' Association, Mr. James Fletcher, M.P., representing the colliery at the meetings. Mr. James Fletcher, jun., is the colliery manager, Mr. D. Puller the engineer, and Mr. R. Davidson the overman, and for some time a very good feeling has existed between them and the miners. The head offices of Messrs. Laidley and Co. are in the Exchange, Pitt-street, Sydney, the management in Newcastle being represented by Mr. Charles Cheater.

The Newcastle Coal Company.

THE Newcastle Coal-mining Company, which may be classed among the largest and most successful in the district, was formed in the year 1877, for the purpose of mining coal from 1,400 acres of the famous Merewether estate at the Glebe. The capital of the company is £130,000 in 13,000 shares of £10 each, and some idea of the rapid development of the colliery can be imagined when it is understood that the present market value of shares is over £17. Their "A Pit" is 303 feet in depth, and is about two and a half miles from the port. In 1885, the company having attained an excellent demand for their coal, sank a second shaft about half-a-mile eastward of the old one, and from that date have been working both pits whenever possible up to their fullest capabilities. The new or B pit is similar to the old one. being 15ft in diameter, but being closer to the sea the seam was struck at a depth of 178ft, the total depth being 190ft 6in. The surface level is only a few feet above the sand ridges of the adjoining coast line from which it is distant about 940yds. To secure the shaft from the stratum of loose surface deposit it was found necessary to wall the first 71ft 6in by 14in brickwork. Below that the strata is rock, which affords a strong and excellent roof to the coal. With the intention of avoiding creeps or crushing of attenuated 4-yard pillars the workings of the B Pit were commenced with 8-yard pillars, and this is undoubtedly according to the Government inspector's ideas—a precaution that deserves special commendation.

The estate worked by the company consists, as before stated, of 1400 acres of leasehold from the Merewether Estate, and besides this the company have the right to mine under that part of the ocean bed adjacent to their property. The grant was taken by Mr. Merewether some years ago, and extends along the coast-line from the southern boundary of the A. A. Company's grant for a distance of three miles, and runs out for a distance of 50 chains. It is more than probable that the coal workings of the B pit will soon be driven under the sea. The seam at present being worked is the Borehole, and its average thickness in the workings is 10ft, but only 6ft 6in are being worked. It lies very regular at a dip of 1 in 40 south, and is almost entirely free from faults. To the south of the B pit the valley trends along the base of spurs from the hill range to the south. On this spur, about 50ft or so above the level of the surface at the shaft, the upper coal seam outcrops, and in the early days of coal-mining this seam was extensively worked by Messrs. Brown and others, now of Duckenfield. The workings were, however, abandoned when the Borehole seam was found underneath.

When the second shaft was opened by the company they found that their capable output had been increased from 850 to 1500 tons of coal per diem, and no less a quantity than 25,846 tons were raised for the five weeks ending the 28th September, 1889. It may be mentioned that this tonnage was only excelled by two collieries in the district during that period. For the year 1885 the output reached 155,950 tons; in 1886, 183,573; while in 1888 only 139 000 tons were raised, but the colliery was idle for one quarter owing to the strike. At the end of the present year the record is expected is stand at over 250,000 tons, as scarcely any time has been lost since the beginning of the year. The company employ 380 miners and 190 shift men and others, and in view of the increasing trade this number will at no distant date be considerably augmented. There are over eleven miles of actual working headings in the colliery all of which have been driven well in advance of the working places. The main engine plane runs between the two pits—a complete system of underground haulage being effected by the tail-rope system, with a surface engine at each shaft. Two powerful Tangye pumps, worked by steam from the surface, keep the workings thoroughly dry, and there is no better drained or ventilated colliery in the district. Air is supplied by a furnace erected under an air-shaft situated close to the A pit, the downcast of course going in the working shafts and ascending up the air pit.

Both of the working pits have two cages, which hold two skips each, the winding being accomplished by two engines of 60 horse-power each. The full skips as they reach the raised platform are seized by men who overturn them on to the sloping screens, which are made of the usual parallel iron bars in a sloping position, the small coal going through while the large or round passes over on to the hopper waggons beneath. In the event of the supply of small coal exceeding the demand, it is stored in a wooden hopper which resembles a huge box raised above the ground to enable the waggons to pass underneath. It is capable of holding 2000 tons, and the skips are hauled up an inclined plane by engine power, and, when above the structure, are emptied. When the coal is wanted the hopper waggons are placed underneath, and filled from a number of shoots, which are closed and opened as occasion requires, filling 25 waggons in a few minutes. The process is remarkably expedient and simple, and obtains in many other collieries. All other appliances, such as winding gear, signal apparatus and tramways, are of the latest design, and no expense has been spared to enable the colliery to rank among the highest in the district.

The workshops and plant are on a large scale, and fully equipped with every requirement that is necessary to keep all machinery, rolling stock, &c., in thorough working order, and

gives employment to a large number of mechanics. The store rooms, where all stock required for the use of the colliery is kept, are large and detached from the colliery buildings, the whole of the structures being neat and substantial, and though not elaborate, are calculated to fully meet all the probable requirements of the colliery.

The arrangements for taking the coal to the port are really excellent, over 300 steel hopper waggons of the latest construction being in daily use. The company have nearly 2½ miles of private railway, laid with 72lb steel rails, extending from their pits to the Government line in Blane-street. Hauling is done by the Government railway department at a fixed rate per ton, while the adjoining Burwood Coal Company also have the use of the railway on payment of a way-leave rate to the N.C.M. Co.

Unlike many of the larger collieries in the district, the company has not eagerly sought markets in foreign countries, but has rather fostered their local and intercolonial trade. They are thus not in such a large degree dependent on the supply of shipping, which at present is unfortunately very scarce. Despite the present hard times the company are unable to satisfy the demand upon their product, and the pits are now working up to the fullest capacity. Large orders are daily being received from Victoria, South Australia, and New Zealand, and, taking all in all, the future prospects of the company are very encouraging and bright.

A very good feeling has always existed between the proprietors and their workmen, as a proof of which the colliery has never been laid idle for a single day on account of any disagreement, with the exception of three months during the late general strike.

An analysis of the Newcastle Company's coal shows that it contains 2·14 per cent. of water, 33·36 of volatile hydro-carbons, 59·16 of fixed carbon, 4·76 ash, and 0·58 of sulphur. Its specific gravity is 1·283, while for coke producing it stands unrivalled, showing 63·92 per cent.

The head office of the company is in Scott-street, Newcastle, from which they have, like many other firms, telephone communication with their pits. Mr. Stewart Keightley is the general manager, and also represents the company at the meetings of the Masters' Association, of which it forms one of the parties. Mr. Alexander Ross was until a few months ago in charge of the colliery, but resigned his position to take up the management of the Wallsend mines. The present colliery manager is Mr. Joseph Croft, late of Messrs. J. and A. Brown's collieries, and Mr. James Clayton is the shipping manager.

J. and A. Brown's Coal Mines.

THE names of James and Alexander Brown are so closely connected with the history of coal-mining in the Newcastle district that any account of its rise and progress would be incomplete, as well as inaccurate, which did not trace the development of the well-known firm of which they were the founders. It commenced, and has grown with the coal trade, and, although the firm is credited by a large number of people with having broken the monopoly enjoyed by the A.A. Company in the early days of the industry, very few even of the old identities seem to know the real circumstances surrounding the case.

Messrs. James and Alexander Brown were brothers, and arrived in the colony from Scotland in the year 1839. They were men of keen perception, and seeing that the district was destined to become a large coal emporium, they turned their attention to mining. At that time the Rev. Mr. Threlkeld opened a mine at Lake Macquarie, and Messrs. Turner, Eales, and others also commenced operations elsewhere. A serious difficulty, however, arose. The Australian Agricultural Company had in 1829 purchased the Government coal-mines subject to certain conditions and provisions, one of which was that the company had the exclusive right to mine coal in the district for a period of thirty-one years. It was not, however, until the year 1844 that the company made any attempt to enforce its rights, although in the meantime a great deal of trouble had occurred. In that year however, the Messrs. Brown commenced to work coal at Four Mile Creek, near Maitland, and pressure was brought to bear on the Government by the A.A. Company to restrain them from continuing the work. In fulfilment of its undertaking with the company, the Government, after long deliberation took proceedings to stop the Messrs. Brown from mining. The now celebrated action of the Attorney General v Brown was commenced in 1846, before the late Judge Dickenson and a Jury, in the Supreme Court, Sydney. The Information (see Supreme Court Reports, vol ii., 1847) was one of intrusion for entering upon certain coal-mines and veins of coal in the county of Northumberland, containing 60 acres, and belonging to the Queen. At the trial the Attorney General proved that the land had been granted to one Dumaresq, from whom the defendant was a lessee, but the Crown in the deed of grant reserved the mineral right, which had been given to another party, namely, the A.A. Company. The plea entered in defence was "not guilty;" that is to say, that the defendant had not so intruded, and several points were raised; the chief one being that under the statute of James I. the proviso of reservation

or exception was void, as it tended to create a monopoly. The case lasted several days, and the learned Judge in addressing the jury observed that they had nothing to do with any question of monopoly. A verdict was given for the Crown on every point, and the defendant moved for a new trial, which was granted. The trial was reheard in the Full Court in January, 1847. The former verdict was upheld on every point, and in delivering judgment (see appendix to vol. ii.) Sir Alfred Stephen, then Chief Justice, said that in the A.A. Company s Act, "for the cultivation and improvement of waste lands in the colony, it was enacted that the company may lawfully hold all lands granted to them by His Majesty (Geo. III), and as the company had the exclusive right to mine coal from under Crown lands, as well as that held by them, the defendant must be restrained from mining." The judgment, a very lengthy one, was final, and there are many people in the district who remember the excitement which prevailed at the time. Though restrained from mining at the Four Mile Creek the defendants were by no means discouraged, and three years later they succeeded in making arrangements with the late Dr. Mitchell to work a portion of the Burwood seam which outcrops from the hills in that district. Soon after the termination of the lawsuit the A.A. Company agreed with the Government to forego their monopoly, and thus ended the struggle.

In the meantime others were working on the estate, and the coal was taken to the town in carts. On the Burwood estate, the Brown Brothers worked until 1852, by which time a railway had been laid by them and others to the port. The Newcastle Coal and Copper Company purchased the tunnels of Messrs. Brown, Donaldson, and Notts, who had by that time succeeded in obtaining shoots adjoining those of the A.A. Company. Mr. Eales (now the Hon. John Eales), and Mr. Christie having obtained an Act of Parliament, constructed a line of railway from Minmi to the Hunter River at Hexham, and started the present Duckenfield colliery. In 1859 Messrs. J. and A. Brown became owners of the mine, and sometime afterwards sold it to the Minmi Coal Company. The colliery soon afterwards was deserted by the company, and the Messrs. Brown again took it over at a cost of £10,000, it having in the meantime become flooded. They had previously purchased numerous blocks of land in the vicinity, and have from that time continued to mine coal from the land.

The estate at present consists of nearly 6000 acres, and is situated among the hills some 12 miles to the west of the City of Newcastle. It is the freehold property of the firm, and is bounded on the south by the Young Wallsend and Monkwearmouth estates, on the east by the Wallsend and Co-operative, on the west by the West Wallsend, while the northern boundary runs nearly to the Maitland railway. Situated in a valley near the centre of the

estate is the thriving township of Minmi, which has a population of over 3000 souls, the great majority of the adult population being employed by the firm. With the exception of a few roads, and some acres given by the firm to the Government for a school and post office, the land belongs to Messrs. J. and A. Brown, who let it to their people on a conditional lease of 21 years, of which over 15 have expired. The houses are mostly of wood, and are erected with no uniformity of design. At present the place boasts of several stores, six hotels, a handsome public school, and two or three churches, which, added to the large establishments of the firm, give the place the appearance of being much larger and more compact than it really is. In the centre of the town is a number of substantial brick buildings, in which the many things required in a large colliery are repaired and constructed. It was at this spot that Mr. Eales, in 1857, put down the Minmi shaft, which was converted by the present firm into a pumping pit for the Duckenfield mine. The largest of these buildings is set apart for workshops, and on entering it on the north side the visitor is shown the fitting shop in which there are five turning lathes, which enable the firm to turn iron up to 8ft. In another part are to be seen horizontal, vertical, and radial drilling machines, where a six-foot cylinder can be bored. Then there is a large iron shaving and planing machine, and a twenty-inch slotting machine, besides a huge grindstone and other numerous labour saving appliances. In this department repairs are done to the locomotives, waggons, and skips, while much of the work in connection with the fleet of small steamers owned by the firm is also taken in hand when the repairing shops at Hexham are unable to accomplish it. Adjoining this is a small foundry in which the firm cast everything they require up to five tons in weight. Here the points for the railway, wheels, and other articles are moulded, and some months ago the cylinders required for the tug boat, Prince Alfred, were turned out. All the brass required for bearings and such things is also cast by the firm, while in case any large and difficult work is required from Britain, the patterns are made locally and sent home. In another part of the establishment is the smithy, in which six forges are continually kept going, the carpenters' shop being on the same large scale. Nearly all the timber required is obtained on the estate, and the firm look for the day when they will be able to smelt their own iron. All the machinery is driven by a 25 horse-power engine, steam being supplied from three common shell boilers, 45ft. long. These boilers also supply steam to an 18in. Tangye pump, which draws water out of the old shaft referred to from the Duckenfield workings. In detached buildings adjoining the workshops are three store-rooms, in which many thousands of pounds worth of ironwork and machinery is kept secure. A little distance away is the locomotive engine shed and the goods shed,

both of which are large brick buildings. In the latter is stored a two years' supply of fodder for the 80 horses employed in the mines, as well as the goods of the local storekeepers and others which are brought from Newcastle by the firm. The whole establishment covers nearly four acres of land, including the coke ovens, which are capable of turning out 200 tons per week, and the whole area is a complete network of railway sidings.

About a quarter of a mile from the workshops, in a north-westerly direction, is the Duckenfield tunnel, which was commenced in the year 1872, and finished in 1874. It goes into the hills at an incline of 1 in 16 for a distance of one mile and a quarter to the north-east. The workings at the present time extend all over the hills, the seam being worked in eight-yard bords and six-yard pillars. The underground haulage is done by horses as far as the main engine planes where the skips are taken out of the tunnel by a wire rope controlled by two engines of 30 horse power each placed some thirty yards from the mouth of the adit. On reaching the main colliery building the skips are overturned, the coal running over the parallel sloping iron bar screens, as at other mines, on to railway waggons below. This mine at present has an output of about 450 tons of large coal per day, but is capable when in full working of raising over 500 tons in eight hours. Air is supplied to the workings by two large furnaces placed at the bottom of two shafts 100ft and 150ft deep, situated about three quarters of a mile from the mouth of the tunnel. They draw from 80,000 to 100,000 cubic feet of air per minute through the mine. The colliery is kept free from water by a Tanyge pump placed in a shaft near the work-sheds. This pump draws 7,000 gallons per hour, the water finding its way to the bottom of the pit by gravitation.

Within another quarter of a mile to the south east of the centre of the town, situated in a deep gully, is the new tunnel known as Brown's Merthyr, or Back Creek Colliery. It is, properly speaking, a separate mine from Duckenfield, as the workings are not joined, though in a few months underground communication will be established between them. The new tunnel was driven into the seam in a south-western direction some five years ago, so as to lessen the cost of underground haulage. An old tunnel exists near the spot, and both are at present being used. The colliery building and plant are similar to those at the Duckenfield Colliery, but the out-put is much greater, being at present over 550 tons of coal per diem, and capable of being worked up to 750 tons. The underground haulage is also the same in both mines, while in the latter ventilation is given by two furnaces placed at the bottom of the shafts. Some four years ago a fire started in the mine from an engine in the pit and before things were in thorough working order again the firm had lost nearly

£10,000. The workings are kept dry by a Tangye pump, placed under a shaft 350ft deep to the south-west, the steam being supplied by a boiler placed on the surface. The small coal from this mine when not in demand is stowed in a larger hopper holding 2,500 tons.

The Borehole seam is being worked in both mines and, including bands, it is 10ft in thickness, but varies under many parts of the estate. Only some 5ft. of the seam is being worked, the tops, owing to the number of bands, being left standing. It dips slightly to the south-west, and is fairly regular. The output of the collieries was very irregular until 1870, when it was about 100,000 tons. In 1885 it stood at 215,723 tons; in 1886, 227,798 tons; in 1887, 154,819; and last year, 156,618 tons were raised, despite the strike, which closed both mines for three months. The output for the present year has been large, no less than 111,626 tons having been won for the six months ending June 30th, and for the succeeding quarter ending on 30th Sept. last the accounts show 46,939 tons, or a total for the nine months of 158,565 tons. At the present the firm employ 360 miners and 160 other hands at their mines, but that number does not include those working at the shoots, in the workshops, or on the tug boats at Hexham.

The arrangements for taking the coal to market are excellent, the firm having as before stated six miles of private railway which is laid with 70lb steel rails, and connects with the Government line at Hexham. There are at present 400 steel hopper and box waggons in use, the haulage to the Government line being accomplished by three powerful locomotives belonging to the firm. A large quantity of the coal is shipped at the private shoots on the Hunter River near Hexham, which are capable of loading over 1000 tons per diem. Vessels of under 600 tons burden are loaded there, but coal for the foreign markets is taken to the port from Hexham by the Government. The firm have also large repairing works there for their fleet of tug boats.

An analysis of the coal from Brown's colliery shows that it contains 1.48 per cent. of moisture, 29.53 of volatile hydro-carbons 61.54 of fixed carbon, 6.62 of ash 0,83 of sulphur, the specific gravity being 1.312 the whole producing 68.16 per cent. of coke.

Mr. James Brown lives in Newcastle, but takes no active part in the business, which is carried on by his four sons. Mr. William Brown is the colliery manager, the business in Newcastle and Sydney being managed by Mr. Alexander Brown, and the London office by Mr. John Brown. Mr. Alexander Brown, senr., died some years ago, leaving his share in the business to his brothers children. The firm forms one of the parties to the Masters' Association, being represented at the meetings by Mr. Alexander Brown.

The Burwood Coal Mining Company.

THE Burwood Coal Mining Company was formed in the year 1883, for the purpose of working the coal at a royalty from under 1,200 acres of the Merewether estate. The capital of the company was originally £60,000, in 60,000 shares of £1 each, but recently 40,000 additional shares were issued, making the present capital of the company £100,000. The leasehold lies south of that portion of the Merewether estate worked by the Newcastle Coal Company, the Waratah Colliery estate being on the east, the ocean forming the western boundary. The land had before been worked by the Newcastle Coal and Copper Company, the operations being confined, however, to the Burwood coal seam, which outcrops along the ravines and sea slopes of the ridges and hills adjacent to Flaggy Creek. This creek empties into the Glenrock lagoon; and near that spot Mr. E. C. Merewether proved the existence of the Borehole seam by a diamond drill some years ago. So disturbed by faults was this belt of the coast line supposed to be, that until the company had actually worked the lower seam very few people entertained any hope that the coal could be profitably mined. Near the lagoon above referred to, at a spot known as Little Redhead, about half a mile east of the coast line, the company, in December, 1884, commenced to sink a shaft to the lower seam. They had previously worked the Burwood seam, but, wishing to extend their operations, they determined to reach the lower one On the 10th of May, 1885, the shaft was completed, the coal being bottomed at a depth of 275ft. Notwithstanding the proximity of the winding shaft to the outcrop of the Burwood seam, it passed through 70ft. of broken rock and surface deposit before reaching solid strata, and for this depth the mine has been secured by brickwork. It appears to have been sunk on the apex of a ridge, from which the coal dips in all directions, as the north heading passes through a basalt dyke 7ft. thick at a point 80 yards from the pit bottom, and under the waters of the lagoon. The coal was found on the same level after passing through the obstruction, but for a considerable distance (nearly 12 yards) it was cindered and useless Another dyke similar to the first, but much thicker, was then struck, and these have proved a great impediment to the development of the northern portion of the leasehold The difficulties have, however, been overcome, and large quantities of coal are now being drawn from the north and western workings, winning headings also running east and south. The company have also secured, in conjunction with the New-

castle Coal Company, Mr. Merewether's ocean leasehold of 1,280 acres, which extends along the coast line from the southern boundary of the A.A. Company's leasehold for a distance of three miles, and extending out to sea for a distance of 50 chains. None of this grant has yet been opened up by either colliery, but there is no doubt that within a few years the workings will extend out to sea. The most easterly heading of the Burwood colliery is still some distance from the coast line, and, owing to a creep in that part some months ago, no coal is at present being drawn from those workings.

At the present time the company have two shafts down to the coal, and a third in course of sinking. The No. 1 or winding shaft, which is above alluded to, is 14ft 6in in diameter, and fitted with double cages, holding two skips each. Winding is accomplished by a pair of 20ft by 36ft engines, working up to an indicated horse-power of 170. The colliery buildings are of the usual kind, the full skips of coal being landed on the raised floor, where their contents are emptied over one of the five screens, the round coal passing over on to railway waggons beneath, and the small running through the parallel iron bars into separate holders. The pithead and all other arrangements are fitted with the latest improvements, and when in full swing the mine is capable of producing 1000 tons of round and small coal per diem. At present the underground haulage is done by horses and a semi-portable engine, but arrangements are being made to install the endless wire rope system, and erect a more powerful hauling plant, which will, as at other collieries, be placed on the surface.

The No. 2 or ventilating shaft, which is situated within a few yards of the main pit, is 300ft deep, and 9ft 6in in diameter. A furnace supplying 90,000 cubic feet of air per minute, is erected at the bottom of this shaft, and is ample for the requirements of the mine. The workings are fairly free from water, all the pumping required being done by a very small plant. The new or No. 3 shaft is being sunk at a spot 85 chains to the south of the present colliery, and is 15ft in diameter. When completed it will be 500ft deep, and a large plant capable of raising another 1000 tons of coal per diem will be placed at its mouth. It is intended to connect it with the present winding pit, and over 50 chains are already driven in that direction. It will thus be seen that the company intend to greatly extend their workings and make the mine as large as any in the colony.

The system of working the seam is much the same as in the majority of the other mines, the bords being 8 yards wide, leaving from 6 to 20 yard pillars. Including bands and refuse the seam is 11ft 1in in thickness, and dips one in forty south. The thickness worked, however, is 6ft 9in; the bottom portion, which

contains a number of thick bands, being left. By this means they obtain a clear seam of 6ft 7in, there being only two bands in it of one inch each. A recent analysis of four samples of the Burwood coal gave the following excellent results:—Moisture, 1·62 per cent.; volatile hydro-carbons, 35·58; fixed carbon, 57·90; ash, 4·90 (containing ·14 per cent. of sulphur); its specific gravity is 1·290; and the whole yielding 62·8 per cent. of coke.

In 1885, the first year of working, the company raised 25,295 tons; in 1886, 72,566 tons; 1887, 111,782; and last year, despite the general strike among the miners in the district, 106,853 tons were won. During the present year the output has been large, 96,424 tons having been raised from the mine for the six months ending June 30. The quarter ending September 30 was also very good, the record standing at 48,735 tons, while at present the daily average output is 714 tons. The colliery gives employment to 400 men and boys; but this number will be greatly increased when the second winding shaft is opened.

The mine is connected with the port of Newcastle by railway, the company having two and a quarter miles of private line which connects with the Newcastle Coal Company's railway at Merewether, the total distance to the cranes being about five and a-half miles. They do their own haulage over their private railway, the Government taking the coal over the remainder of the distance, at a fixed rate, the company also paying the owners of the line a wheel rate. There are 225 hopper waggons in daily use, and when the new mine is opened the railway will be constructed to it. The present trade prospects are exceedingly good, the major portion of the coal being sold in Melbourne, Adelaide, and Sydney, while a little is despatched to foreign markets.

The company form one of the parties to the Masters' Association, being represented at the conferences by Mr. Russell. Mr. J. J. Weston, the manager, resides in Sydney, the local office being under Mr. F. H. Langwill. Mr. W. P. Pendleton is the colliery manager, and under his supervision the mine has been opened out and developed.

The Greta Coal Company, Limited.

THE Greta Coal Company was formed some four years ago, for the purpose of working the coal from a large estate, then the property of the Hon. E. Vickery, M.L.C., of Sydney. The capital of the company is £150,000, in 75,000 shares of £2 each. In 1886 they purchased the estate, which consists of

2,136 acres, and also secured another 2,000 acres of coal bearing land at Leconfield, some 2½ miles from Greta.

Properly speaking, the Greta mines cannot come under the heading of "Newcastle Collieries," as they are situated on the Great Northern Railway, some 32 miles from the port of Newcastle. Soon after Mr. Vickery proved the existence of the Greta seam, he had a shaft put down on his property, which is now known as the B Pit. It is 450ft. deep and 15ft. in diameter. When sinking the pit a great number of carboniferous fossil fauna, such as Spirifera, Producta, Conularia, Orthoceras, and very large Inocerami were found, and a small patch of rich petroleum oil cannel coal was also met with. The township of Greta at that time only consisted of a few huts, but to-day it is a thriving place with a population of over 2,000 persons. One of the shafts put down on the Vickery Estate caught fire, and continued to burn for many months.

At the present time there is only one working or drawing shaft on the first leasehold, and this is known as the B pit. It is within a few yards of the Government Railway, and about a quarter of a mile from the centre of the town. It is fitted with all the modern appliances for lifting large quantities of coal, the winding being accomplished by a pair of engines which have an indicated power equal to 117 horses. The cages are made to bring up two skips at one time. The coal, as it reaches the surface, is tipped over four inclined screens, which are on the parallel iron bar system, on to the steel hopper waggons beneath. The small coal which passes through the screens falls into a large hopper, from which it is raised by an endless belt, carrying buckets, to a washing machine about 20ft. above. There the dirty matter in the coal is separated and thrown on one side, while the washed article is heaped on the other, the one being sent away as "washed nuts" and the other used as ballast This system of treating the small coal is unique in this district, and does not obtain anywhere else in the colonies.

The underground hauling at the Greta Colliery is accomplished by an endless wire rope, controlled by an engine on the surface. This system is identical with that of the cable trams, and indeed it may be stated that this, like many other great improvements in land locomotion, has emanated from coal mines. From the pit bottom there are two main engine planes—one going to the south level and the other to the north—the total hauling distance being nearly two miles. The skips of coal are drawn from the working places to the main ways by horses, and some idea of the extent of the workings may be gleaned from the fact that the total length of the headings actually in use is over 18 miles. The system of working the seam is the same as that in other collieries, namely, eight yard bords and five or six yard pillars.

Up till recently the workings were ventilated by two furnaces, but as the mine developed they were found to be inadequate, so, the C Pit, which was formerly a working shaft, was turned into an upcast ventilating shaft. Unlike the mines in which the Borehole seam is worked, the Greta Colliery is not entirely free from inflammable gas, so that the question of ventilation is an important one. When the supply of air from the furnaces was found insufficient the company erected a large Guibal fan, 34ft in diameter and 12ft in breadth. This revolves about 35 revolutions per minute, and draws nearly 120,000 cubic feet of air through the workings per minute. It is, however, capable of drawing much more, but at present the supply is ample. It is worked by an engine of 170 horse.power, but to meet the contingency of a breakdown a duplicate one of equal power is erected alongside, which could be attached to the crank of the fan before the air current could cease. In the event of an accident in the mine, this shaft could be used by the miners if the escapes to the working pit were blocked, and for this purpose a winding plant is erected at C Pit. The workings are kept dry by a lift pump worked by steam erected at the receiving shaft, but the mine is comparatively free from water, as only some 50 gallons per minute are taken out.

The Greta seam, which has long been famed for the excellence of its mineral, lies very regular, is free from faults, and dips about 1 in 6 to the west. This dip, however, is in some places much greater, and as an indication of this it may be mentioned that although the pit bottom is 450 feet from the surface the workings at the far end are over 800ft. A section of seam near the outcrop shows a thickness of 26ft, including a clay band of 4ft 4in and other small ones. Half a mile under the hill, however, it decreases to 16ft 2in; but the mean thickness of coal is about 12ft. It is worked the full height, and contains four bands—three of clay and one of black shale. The seam exists under the whole of the estate, and so far not a single interruption has been met with.

Out on the Leconfield Estate, about 2½ miles north of the B Pit, and situated on the side of a hill overlooking the valley of the Hunter, the company have driven two parallel tunnels into the outcrop. The seam here is only 6ft 6in in thickness, but what it lacks in thickness it makes up in quality, as an analysis of the coal proves it to be equal to the best Welsh. At present these tunnels are in a distance of 800ft, but no coal will be drawn until they are down 1500ft. To reach this point, relays of miners are working night and day, and in the meantime preparations are being made to erect powerful hauling engines, screens, and other machinery capable of drawing 1000 tons of large coal in eight hours. A line of railway now connects Leconfield with the Greta Colliery.

At the Greta Colliery proper the company are making preparations to increase the present output to 1000 tons per diem, and for this purpose are erecting a new pit-top pulley-frame 50ft in height, having wheels 12ft in diameter. A new coal-washer is being fitted up which will not only cleanse the small coal but discharge into the furnaces all unsaleable mineral. The hauling plant is being extended, and the cages are to carry four skips instead of two as at present. When these arrangements are carried out the company will employ nearly 1000 men, and hope to excel the largest collieries in the district.

At present the output is between 700 and 800 tons per diem; and for the present year the company expect a total of over 200,000 tons. There are at present 350 men and boys employed below ground, and about 90 on the surface. The amount raised in 1886 was 98,280 tons; in 1887, 92,733 tons; and last year the record stood at 99,109 tons, despite the strike, which closed the colliery for three months.

The great drawback to the development of this colliery in the past has been the tremendous cost of haulage to the port of Newcastle, which is 32 miles distant. It costs the company fully one shilling more per ton to ship their coal than it does the Newcastle collieries, but despite this it can more than hold its own in the market. At the present time the major portion of the output goes to foreign countries, where it is well-known, and commands the highest prices. It has long been used on the Californian and Japanese railways, while for gas purposes the name of Greta coal has become famous everywhere. No doubt, with the increased output, the company will be in a position to supply the intercolonial market, which, so far, has obtained very little of the mineral. It has a specific gravity of 1·287, and a chemical analysis of:—Moisture, 2·25 per cent.; volatile hydrocarbons, 39·21: fixed carbon, 54·41; ash (buff coloured), 2·72; sulphur, 1·41. So far as is yet known the Greta seam contains a less percentage of ash than any coal in the district.

The colliery is a non-associated one, and is at present under the charge of Professor Benton, an eminent mining engineer from England. A large amount of the success of the colliery has been due to Dr. James R. M. Robertson, who took the management of the mine some seven years ago, when it was in anything but a flourishing condition, and year by year increased its output until it was brought to the front rank. Mr. George Bewick, jun., is the shipping manager, the Newcastle office being in Scott-street.

The Stockton Coal Company.

THE Stockton Coal Company was formed in 1882 with a capital of £100,000, in 100,000 shares at £1 each, for the purpose of mining coal from the peninsula of that name, which lies to the north of the Newcastle harbour, and separates the Pacific Ocean from the estuary of the Hunter. The land is entirely composed of sand, raised a few feet above the level of the sea, and is covered with low scrub. It measures six miles in length, and in appearance resembles an aboriginal's "waddy" with the thick end to the south. The lower portion only is supposed to contain available coal, and 25 years ago the late Mr. Jonathan Dixon put down several bores over the peninsula. He found large deposits of quicksand and clay overlaying the Borehole seam, which was afterwards found by the Scottish Australian Mining Company, which at that time held 610 acres of the land. The quicksand was proved to be held in suspension by water below the level of the sea, and the opinion is general that an underground current or set exists between the Pacific and the estuary of the Hunter. The Stockton Company, however, determined to sink a shaft, and at that time there were not wanting persons who prophesied the speedy failure of the plucky venture. They secured the right to mine the coal at a royalty from under 120 acres of the Quigley estate, which was formerly the property of the late Dr. Mitchell. A shaft was commenced on the southern extremity of the peninsula at a point about 250 yards from the wharves, and about 400 yards from the ocean. Owing to the softness of the surface strata, iron cylinders 15ft in diameter, and made of cast-iron $1\frac{1}{8}$ inch in thickness, and formed of rings 5ft 6in in depth, weighing about 8 tons, were sunk, under the able supervision of Mr. Rossiter, of Sydney. These cylinders were forced down to a depth of 84ft. Below that a 4ft 9in coal seam was found, but, wishing to strike the Borehole seam, work was continued through 265ft of solid rock. Just before reaching the coal the edge of a dolerite dyke was struck, the coal on one side of it being obliterated. Indeed, the shaft may be said to have been put down amid a plexus of faults and intrusive dykes that in parts destroy the structure of the coal and have greatly impeded the development of the mine. The total depth of the shaft is 364ft, which makes it one of the deepest working in the Northern district, but the result has justified the enormous cost, as the seam is 29ft 7in in thickness, including a band of blue shale of 6ft 6in, and other impurities, which leave nearly 20ft of marketable mineral of the highest quality. At the present time

it is being worked in two sections, as if there were separate seams, the top seam being 11ft and the bottom 7ft 6in. In one part of the mine the former is worked, while in the other they are going under the bottom of the blue shale, which varies in thickness from 6ft 6in to 12ft. In one part of the mine both sections have been worked, one above the other, forming, according to the Government inspectors, an ideal seam, and one that can scarcely be surpassed. The parting from the roof is excellent, and the seam is very free from bands. The coal is friable, yet not sufficiently so to cause any depreciation during export.

In July, 1885, the company commenced to win coal from their mine, and headings were driven in all directions for the purpose of thoroughly opening out the colliery. Numerous faults were encountered, while in the north-east headings the seam was found burnt to a cinder, and in another place it had been denuded. By dint of perseverance and good management the company have succeeded in driving their headings through the dykes and faults, and picking up the seam again on the other side. The difficulties which have been overcome from the interposition of the faults in this colliery have thus been of no ordinary description, and, as stated by many experts, it would almost appear that the Stockton peninsula is intersected by dislocations that must be a serious handicap to the successful development of the colliery. As the workings have progressed, however, the difficulties have decreased, and for some months the mine has been working up to its fullest capacity.

A short time after the opening of the colliery the company succeeded in obtaining from the Scottish Australian Mining Company the right to win the coal from under 610 acres to the north of the colliery. The lease is held from the Government, and was acquired by the Scottish Australian Company many years ago. A number of bores have been put down in different parts of the leasehold, but with very little success. That the seam gives out as it goes a good distance north, is probable, as coal pipes, interlaminated with strata, are all that up to the present have rewarded the attempts at further discovery. Under the Government leasehold, however, a good seam has been found, and for the purpose of winning the coal the Scottish Australian Company many years ago attempted to sink a shaft 6ft 6in in diameter on their land. The undertaking was abandoned owing, it is said, to iron cylinders having canted when they reached the clay.

Besides these two parcels of land the company have also obtained over 1000 acres of the Quigley estate north of the leasehold referred to. They have also an area of 680 acres under the ocean. This grant was applied for by Messrs. T. Garrett and Cowlishaw, and transferred by them to the Stockton Coal Com-

pany. It commences 30 chains north of the shaft, by a narrow strip 20 chains wide, and continues of this width along the beach for about 30 chains. It goes due east into the Pacific for about 1½ miles, and a further grant, making 1500 acres in all was given to the company. The water only increases about 20ft in depth for every forty chains seawards. Notwithstanding that, the late Royal Commission on the condition of the collieries adjacent to Ferndale, considered that the winning of coal under the ocean in that particular part cannot be safely undertaken until it can be established that coal exists covered by strata unmistakably more favourable than that which overlies it in the Stockton Peninsula. The disturbed character of the ground met with in the headings approaching the sea was, however, of such a nature that the work of pushing them forward was stopped, and the colliery is now being worked mainly in the north-west direction. Many people suppose that the headings are already under the harbour; but such is not the case, as the grant only extends to the water's edge. The system of working the coal in the Stockton Pit is that known as pillar and bord At one time the bords were 8yds with 6yd pillars, but now they are 6yd bords with 6yd pillars, with the former turned away narrow, thus ensuring to the mine an adequate amount of security.

The machinery of the colliery consists of two 60 horse-power coupled horizontal engines for winding the cages from the shaft. Two cages work in the shaft, and bring up a pair of skips at one time. Steam is supplied from five steel shell boilers, 40ft. long and 6ft. 6in. in diameter, while the workings are kept dry by a 45-horse power condensing engine, working an 8in. Blake pump. A complete system of underground haulage by a wire rope prevails, while the screens are on the sloping bar system so common in the district.

The ventilation of the colliery is effected by a furnace at the bottom of an air-shaft put down some distance from the working pit. For the purpose of increasing the output, and developing another portion of the estate, the company lately decided to sink a second working-shaft, and for that reason have called up another £20,000 of their capital. The site of the new pit is not yet finally decided upon, but will probably be about one mile north of the present one. With this shaft the ventilation will be greatly improved, and equal to that of any other mine in the district.

The present output is about 18,000 tons per month, and for the half-year ending June 30th last, 120,000 tons were raised. The mine is capable when worked to the fullest extent of putting out 250,000 tons per annum, but when the second working-shaft is finished that capacity will be greatly increased. In 1886 the total output raised was 84,459 tons, but in 1887 it was increased

to 150,000, valued at £62,000. Last year the amount raised was 182,480 tons, a record which was only excelled by Wallsend and the A.A. Company. It was, however, owing to the fact that while nearly all the collieries were closed for three months during the year on account of the strike among the miners, the Stockton Colliery was, owing to certain special arrangements, only idle for a few weeks. These figures, however, show that the mine has been developed with great rapidity. At the present time nearly 330 men are employed in the colliery, and 70 on the surface.

Being within a few yards of the harbour the company are able to ship their mineral with but little handling, and at a very low cost. They have at the present time two staiths, at which the largest vessels can coal. The waggons after being filled at the screens are hauled up an inclined plane on to the loading banks by means of a wire rope attached to the drum of an engine. Besides this they have the use of one of the Government steam cranes, and are in a position to load over 1000 tons of coal per day. The trade of the Stockton Company is principally intercolonial, but they intend developing a foreign market. They have secured a six years' contract to supply the Melbourne Gasworks with nearly 200,000 tons of coal per annum at 11s. per ton; and, as this represents three-fourths of their capable output, the company have little reason to fear a depression. The contract is dated from the 1st of January, 1888.

The head office of the company is in Sydney, where Mr. J. J. Weston, the general manager, resides. Mr. J. M. Hyde is the local shipping manager, and Mr. Jonathan Dixon is the colliery manager. During the recent strike the company seceded from the Northern Coal Sales' Association, and the colliery is now a non-associated one.

The Hetton Coal Company.

THE Hetton Coal Company, with a capital of £106,000 in 21,200 shares of £5 each, was formed in the year 1885 for the purpose of mining coal at a royalty from under the estuary of the Hunter River, or, more properly, the harbour of Newcastle. The grant was in the first instance held by Messrs. Steel and Hutchinson, and is peculiar in having practically no coal except under tidal waters. The area is of a semi-lunar form, and measures 1600 acres, commencing outside the harbour and extending right up beyond the probable line of outcrop of the coal seam. It includes the oyster bank, which is a peculiarly exposed portion of the coast

and joins the ocean lease of the Stockton Coal Company. The depth of water in the horseshoe bend varies from 26ft to 40ft, and this increases to over 80ft at the eastern boundary beyond the oyster bank. It will thus be seen that the colliery is a most remarkable one, and is unique among the coal mines of Australasia.

For the purpose of getting at the coal it was, of course, necessary to secure a dry piece of land, and after much trouble the company succeeded in obtaining an allotment of six acres on the marshes of Bullock Island, about 700 yards to the eastward of the Wickham and Bullock Island Colliery, and known as Pig Island. Shortly after the formation of the company the present working shaft, 16ft in diameter, was commenced at a point only 200 yards north of the dyke engine house, and within a stone's throw of the wharves. Iron cylinders, 1½in in thickness, with webs and flanges of adequate strength, were sunk by pressure through the stratum of sand and mud, 45ft in thickness, until they passed 20ft into a deposit of pliable plastic clay. The method of sinking the cylinders was to force them down in advance of the internal excavation by the weights, of as much as 600lb, piled on the top ring. When they entered the clay the course pursued was to add plates to the cylinder as the stuff was dug out. After passing through the clay some 160ft of hard grey post rock was passed through and the Borehole seam found at a depth of 215ft. It is 21ft 6in in thickness including the bands, making the total depth of the shaft over 236ft. To obtain access to the coal under the harbour the company obtained leave to drive the winning headings under the wharves and hydraulic cranes, a work which has long since been accomplished.

Last year a second shaft for ventilation and pumping was commenced a few chains to the southward of the winning pit, and this was completed in November, 1889. A Guibal fan, with a 30-in flange, capable of throwing 200,000 cubic feet of air per minute, and also a powerful Tangye pump, to work by compressed air, will be connected with this shaft. At the present time the workings are kept dry by a small Tangye pump, while a supply of air is obtained from the main shaft. The machinery and plant of this colliery are large and extensive, and when the mine is fully opened out will be capable of raising over 1000 tons of coal per day. Two horizontal engines with 26-inch cylinders, having a power equal to 160 horses, are being fitted up in an extensive building, while at present the hauling is done by a 36-horse power engine. The main winning heading or engine plane runs east, and is now nearly across the harbour, a crosscut being driven to the south-east; while another heading is under No. 7 crane, about 20 chains from the shaft. The first coal was brought out in 1887, in which year 1,100 tons were raised. In 1888 the total output was 22,287 tons, despite the general strike, which closed

the mine for three months. Since then vast strides have been made, and at present the daily output is about 300 tons. For the five weeks ending September 28th, 7,740 tons were raised, and 250 men all told now find employment at the mine. The shaft being 16ft. in diameter, the cages hold two skips each, and at present there are three sloping parallel iron screens in use, but shortly this number is to be increased to five. The system of underground hauling is to be by the "tail rope," worked by the large engines before referred to. A large hopper, capable of holding 1,200 tons of small coal, has been completed, and in a few months the output will be greatly increased.

The system of working the coal is much the same as that obtaining in the adjoining Wickham and Bullock Island Colliery, the tops being left, and from 6ft to 8ft of the splendid seam alone being worked in the 6 yard bords, leaving 6 yard pillars. The seam improves as the headings are driven under the harbour, the coal being cleaner, and containing less water. A recent analysis of several samples from this mine shows it to contain from 1·8 to 2·26 per cent. of moisture, 35·89 to 37·6 of volatile hydro-carbons, 54·3 to 61·05 of fixed carbon, and 2·40 to 6·1 of light-red ash, with a trace of sulphur.

Being so close to the wharves the haulage from this mine is done very cheaply, the company having several sidings and a long distance of standing room, so that the Government engines can take the waggons to the cranes in a few moments. At present there are 200 steel hopper waggons in use, but this amount will shortly be increased by another fifty. The trade prospects are good, the most of the product at present being disposed of in the colonies. New markets are, however, being opened up with the seaboard of America, where several shipments of coal have already been sent and spoken highly of.

The head office of the Company, which is a party to the Masters' Association, is in Sydney, where Mr. James S. Hutchison, the secretary, resides. Mr. William Thornton is colliery manager, and Mr. A. Mathieson engineer, and the mine has been opened out under their supervision. Mr. John Waddell is the shipping manager, the local office being in Scott Street.

Wickham and Bullock Island Coal Company.

THE Wickham and Bullock Island Coal Company was formed in Sydney in the year 1879 for the purpose of mining coal from two leaseholds—one being the property of Mr. Peter Fleming, and the other belonging to the Government. The well-known Throsby's Creek, which is 230 yards broad and 4 feet deep,

divided the two estates. A shaft was put down on the first-named leasehold and the Borehole seam found to be 12ft in thickness. The winning of the coal so close to the wharves of Newcastle created a lot of interest in mining circles at the time. The company, some few years after commencing operations, obtained a large area from the Government, and their estate at the present time has an area of 2150 acres. It extends from the harbour basin on the south, to Goat Island, taking in the whole of Bullock Island, now known as Carrington. The western limit is the far side of Throsby's Creek, while the extensive Bullock Island dyke, at which nearly all the coal mined in the district is shipped, forms the eastern boundary. The capital of the company is £110,000, made up of 70,000 shares fully paid up to £1, 20,000 preferential shares paid up to 5s. and a like number of contributing shares also paid up to 5s. Shares are now at a premium of 10s, and the company have recently declared a dividend of 20 per cent.

For some years the company obtained coal from the old Wickham shaft, now leased by them to the Linwood Colliery, and in 1883 commenced to sink a pit in Cowper-street, Carrington, but the authorities ordered the cessation of the work there, a course which resulted in a serious loss, and great inconvenience. About the end of June, 1884, Mr. Hugh Walker, with the assistance of Mr. Fairley, commenced to sink the present shaft close to the southern side of the Bullock Island railway, just half a mile from the cranes. As in the case of all delta collieries, the work was difficult and extremely laborious, owing to the soft nature of the surface deposits. Iron cylinders, 10ft in diameter, in six segments 3ft in depth, were manufactured by Messrs. Morison and Bearby, the well-known ironfounders, whose premises are close to the colliery, and sunk by pressure to a depth of 173ft, where they rest on the hard rock. These cylinders were the first put down in the district, and are thoroughly water-tight. The total depth of the shaft is 231ft, and it was finished in the short period of eight months. After the 173ft of sand, gravel, and clay had been passed through with the cylinders, the strata between it and the seam was found to be entirely of hard rock. The coal at the bottom of the shaft was 18ft 6in in thickness, but only the bottom portion has since been worked. The easterly heading of the old Wickham Colliery communicates with this mine, but a barrier was left as a boundary to the old Maryville workings. When the shaft was completed an unique system of "winning off" was adopted—the headings being only 6ft wide, while the bords were 6 yards, leaving pillars 8 yards in thickness. In view of the flooding of the Ferndale Colliery, the workings of which were under Throsby's Creek, the precaution was a wise one, and was commended by the Government officials. As much of the estate lies north of the railway, the primary operations were considerably

hampered owing to the necessity of driving headings across the railway-line and leaving portions underlying private property. For some time after the colliery started operations, the major portion of the workings were north of the line, but of late the southerly portion has been worked, and at present the south-east heading is half-a-mile from the bottom of the shaft.

The underground haulage obtaining at this colliery is accomplished by the main rope system, with an engine of 15-horse power placed at the surface of the working shaft. The wire rope goes from the drum of the engine down the shaft, and from thence to the end of the main ways on steel rollers. The full skips are thus brought up to the bottom of the shaft, where they are placed on one of the single-decked cages and taken up to the screening floor. The cages only hold one skip at a time, but, notwithstanding that, the capable output is 700 tons per diem. An engine of 40-horse power does the winding, while the necessary gear is of the most recent and improved type. For the year 1886 the output of this colliery was 55,553 tons, valued at £26,229. In 1887 it was 59,553 tons; and in 1888, 68,240 tons. For the first half of the present year over 55,000 tons were raised, while for the month of August last the returns show 19,100 tons, and for September 15,800 tons. The development of the mine has thus been very rapid during the last twelve months, and the trade prospects are very good. At present some 250 miners and 125 wheelers, drivers, and shiftmen are employed by the company.

The ventilation of the workings is obtained by a Walker fan, erected at the mouth of an air shaft which was put down 26 chains to the south of the working pit. During the first years of the company's existence the ventilation was given from the old Wickham shaft, now known as the Linwood Colliery, which was put down on Fleming's property, on the other side of Thorsby's Creek, but this was abandoned when the present air-shaft was finished. The fan is capable of throwing 50,000 cubic feet of air per minute, and is ample for present requirements. Water is also drawn from the air-shaft by a powerful Tangye pump, worked by a boiler which also supplies power to work the fan.

As before stated, the seam is 18ft. 6in. thick, but the bottoms only are being worked, the top coal being left for the purpose of forming a safe and reliable roof. The total thickness worked varies from 8ft. to 12ft., but eventually the top coal will also be taken down. As much of the land is under water, the pillars can never be worked, and for some time past the mode of working has been changed to 6-yard pillars and 6-yard bords. The seam dips slightly to the south-east, and a recent analysis of the coal gives the following results: Moisture 3·2 per cent., volatile hydro-carbons 35·6, fixed carbon 60·1, ash 1·1, and a trace of sulphur.

Being so close to the wharves the cost of haulage is reduced to a minimum, and is done by the Government at a low rate. The company have 138 steel hopper waggons, and are now obtaining a further supply of 100. A branch line goes under the colliery shed, and the coal, after passing over the usual sloping parallel iron bar screens which separate the small, goes on to the waggons beneath. The trade of the company is chiefly local and inter-colonial, and, although the late strike operated strongly against it, it is now obtaining a good demand in foreign countries.

The head office of the company is in Sydney, where Mr. Marshall Bayley, jun,, the general manager, resides. Mr. Jas. Fletcher is the colliery manager, and Mr. H. R. Smith is shipping manager. The company until recently formed one of the parties to the Masters' Association, but retired soon after the recent strike.

The Waratah Coal Mining Company.

THE Waratah Coal Mining Company is one of the oldest in the district, having been formed in the year 1863 for the purpose of mining coal from under the Waratah Estate. The capital of the company is £60,000, in 10,000 shares of £6 each, and for some years after its incorporation it was looked upon as one of the most prosperous in the district. Work was commenced by driving a tunnel into the outcrop of the Borehole seam, on the hills at Waratah, and for many years an excellent seam, averaging 10ft. in thickness, with only three small bands, was worked. The output for 1863 was 5,016 tons, but in the following year 59,912 tons were won. For the next five years the price of coal was exceedingly low, there being great competition among the several companies, and in consequence the output of this colliery was considerably decreased. In 1869 a second tunnel was opened near the first, and in 1872 the output was 167,794 tons; in 1873, 182,806; 1874, 177,538; and in 1875, 160,303. The company continued drawing coal from the adits until 1876, when the estate was nearly worked out. A private railway was constructed from the colliery to the company's shoots at the southern branch of the Hunter River, a distance of three miles, where they still ship the major portion of their coal.

In 1876 they purchased a large estate surrounding the present township of Charlestown, consisting of 2,600 acres, and adjoining the New Lambton colliery. A shaft, then known as Charles' pit, was sunk on the "Gully" or Burwood seam, a depth of 250ft., and 5ft. of coal was worked. The quality of the mineral

being against it, the enterprising company abandoned the shaft, after working it for six years, and opened an adit on that part of the estate known as East Waratah. The Borehole seam was here found to be 8ft. thick, and, after working it until a few years ago, the company let it on tribute to Mr. T. G. Griffiths, who now works it under the name of East Waratah. As the workings extend south, the seam deteriorates and gets much thinner; but there is still a large quantity of good coal in that part of the estate. Before parting with this colliery, the company had once more turned their attention to the Charlestown land, and on discovering that the Borehole seam existed under the Burwood, they determined to sink the Charles pit much deeper. This was practically the fifth colliery opened by the company, and it is now being worked by them under the name of South Waratah. There are three shafts down to the coal, the main or winding one being down 500ft.—the deepest yet worked in the district. It is 15ft. in diameter, and is fitted with double cages, which hold two full skips of coal each. The winding is done by a 24in. cylinder engine of 100-horse power, while the pit-head, screens, and other appliances are of the latest design and construction. A second shaft, known as the Flaggy Creek pit, over a mile to the eastward, was sunk to the coal about the same time as the main one, and is 460ft. deep and 9ft. in diameter. A perfectly straight drive, 2,120 yards long, now connects the two shafts, and everything is in readiness to raise large quantities of coal. At the mouth of the Flaggy Creek shaft is a 12in. cylinder engine of 25-horse power, which works a ventilating fan besides a winding cage by which the miners go down the mine. In addition to the fan the workings are supplied with air from a furnace placed at the bottom of an upcast shaft 520ft deep, so that the ventilation of the colliery is excellent and far above the requirements of the law. This air shaft is situated within 200 yards of the main pit, and is bricked for nearly the entire depth.

The underground haulage in this mine is accomplished by a pair of Tangye hauling engines having 12in cylinders with a 20in stroke, and equal to the power of forty horses. The wire rope goes round a 6ft drum, and thence along the main engine plane on rollers, as in other collieries, for a distance of over a mile. At present the drives and headings have an aggregate length of some three and a-half miles, and are well in advance of the working places.

The seam is 7ft 5in in thickness, and is worked to its full height on the pillar and bord system; but when working the Burwood seam the company introduced the long-wall mode of winning the coal. It lies very regularly with a dip to the south, and contains four bands. A recent analysis of the

coal gave the following results :—Water, 1·72 per cent.; volatile hydro-carbons, 34·35; fixed carbons, 59·12; ash, 4·40; sulphur, 0·41; the specific gravity being 1·316; and the whole containing 63·52 per cent. of coke. At present the mine gives employment to 200 men, while 22 horses work underground. In 1885 the company raised 65,760 tons, in 1886 46,227 tons, but in 1887 the amount was only 5451 tons; but it was owing to the opening of the new colliery. Last year 45,897 tons were won, in spite of the mine being closed during the general strike, and also a few weeks in addition owing to a local strike. The latter unfortunately occurred just as the colliery was being developed, and greatly retarded the work. At the present time the output is 350 tons per day, and for the last half-year ending June 30th some 45,000 tons were raised, irrespective of the pit which is being worked on tribute.

The company have 10 miles of private railway, including that connecting the old shafts with the port. The present line from South Waratah joins the Great Northern railway near Hamilton, and the company do their own haulage, having three locomotives for the purpose. The major portion of the mineral is shipped at private shoots, which adjoin the Hunter River Smelting Works, and vessels drawing up to 15 feet of water can load there. Some 137 hopper waggons, each holding nine tons, are in daily use, while the small coal produced in the mine is used by the Smelting Company, 14 hopper waggons being employed constantly taking it to the works. When the supply of small coal exceeds the demand it is stored in a hopper capable of holding 850 tons, and situated near the Raspberry Gully or main mine. During its existence the company has formed and sold several townships on their estates.

The head office of the company, which is not a party to the association, is in Sydney, where Mr. W. Clark, the secretary, resides. Mr. T. D. Ramsay is the colliery manager, and Mr. George Bewick, jun., is the local shipping manager.

The New Lambton Colliery.

IN the year 1867 Messrs. J. and A. Brown commenced to work coal from the New Lambton Estate, which at present is the freehold property of Messrs. George R. Dibbs, and Alexander Brown, M's.P. It consists of 1225 acres, and is bounded on the north and east by the Commonage, on the south by the Waratah Coal Company's land, while the estate of the Scottish Australian

Mining Company forms the western boundary. Prior to opening a mine the firm obtained a mineral lease of some 280 acres from the Government, and on this block, which lies to the north of the present estate, the now celebrated Dog and Rat, or A Pit, was sunk. Shortly after it was opened, Mr. James Brown sold his share to Mr Dibbs, and the new firm having purchased several blocks of land, sunk a second shaft to the south of the old one, known as the Hartley Vale Colliery. The output for both the mines was good, being in 1868, 44,437 tons; in 1869, 108,702 tons; and in 1870, 117,962 tons. Owing to the inferior quality of the coal, the Hartley Vale Colliery was abandoned, and the firm put down the B or New Lambton Pit, which was opened about the year 1870. This mine was worked until the beginning of 1888, but the old Dog and Rat shaft was worked out in 1884. The B Pit was a very successful one, the seam being 8ft in thickness, very free from faults, and lying at an inclination of 1 in 40 south. Some six years ago it was found that as the workings proceeded in a southerly direction, the coal was deteriorating in quality, and the firm commenced to sink their present C Pit on a 640 acre block, some 82 chains to the south of the old shaft.

In 1884 this shaft was opened and the old B Pit finally abandoned. The main shaft is 243ft deep, 15ft in diameter, and fitted with double cages, each of which holds two skips. The winding is accomplished by a 25 horse-power engine, the pit-head and other appliances being of the latest design and construction. At present the underground haulage is done by horses, but an engine of 16 horse-power is being fitted up to do the work. A shaft 248ft deep was recently put down some 88 yards to the north-west of the winding-shaft, and a furnace capable of drawing 80,000 cubic feet of air through the workings per minute is placed at the bottom. The mine is very free from water, all the pumping required being done by a 12-inch cylinder Tangye, steam being conveyed to it from the surface.

The Borehole seam is being worked in this mine to a height of 5ft 6in on a different principle from that obtaining in the other district collieries—something between the bord and pillar and longwall methods—the headings being driven in the same as at other collieries, but the working places are double width, namely, 16 yards. The refuse from the seam is piled up for a width of 6-yards, and a 6-yard pillar is also left. Under this system the management claim that a freer and better current of air is circulated, especially round the face of the workings, and, at the same time, more coal can be got out.

Close to the shaft and going into the hill of the outcrop is a tunnel, by which the top or Burwood seam is worked. This tunnel is driven in a south-western direction for a distance of some twenty chains, the seam being 8ft 10in in thickness, in-

cluding a band of indurated clay 16in thick. It is worked on the pillar and bord system for about 5ft of its height, and is good steam coal. Owing to the dip of the seam which is 1 in 30 to the south, the tunnel goes in at a good inclination, the empty skips finding their way to the end by gravitation, the full ones being hauled to the receiving floor, also used for the coal from the shaft, by a wire rope controlled by a 16 horse-power engine. There are at present four common sloping iron bar screens in use, but the two coals are always kept apart, that from the tunnel having a separate screen. Steam is supplied to the engines by three shell boilers, each 33ft long, and 5ft 6in in diameter, while near the main colliery buildings, which are of wood, are the workshops where all the necessary repairs to the colliery plant are accomplished.

In common with many of the other collieries, the New Lambton mines are at present very slack, and have been for some time past. There is a good demand for the coal for foreign markets, but as the major portion of it goes to India and the east, some difficulty is found in getting ships. The shaft is capable of raising 500 tons per diem, and the tunnel 200 tons, but at present the daily output, when the men are working, is only 300 tons. In 1885 the output from the mines owned by the firm was 58,174 tons; in 1886, 71,370; in 1887, 61,829; and last year 64,237 tons were raised, although the men were idle for three months in consequence of the strike. For the present year the output has been fairly good, considering that the mine is a new one. Some 20,235 tons were raised during the six months ending June 30th, and 7,625 tons during the quarter ending the 30th of September last. An analysis of the New Lambton coal from the lower seam shows that it is very similar to that in the adjoining colliery of Waratah. The employees number 200, but when in full swing again the mine will require a great many more men.

The firm have a branch line, one mile in length, connecting the Sydney-Newcastle railway at Adamstown, the total distance to the pit being five miles. They have also a railway to the old pit, joining with the Government line at Waratah, but this is now very seldom used. There are 210 railway waggons in almost constant use, and the haulage is done by the Government Railway Department.

The firm form one of the parties to the Masters' Association, being represented at the conferences by Mr. Alexander Brown, M.P. Mr. James Thomas is the colliery manager, and Mr. Charles E. Banclaud has charge of the shipping.

Returns for 1889.

OWING to a delay in the publication of this work, we are enabled to give a series of returns of the amount of coal raised in the district for the year ending December 31, 1889, which in previous years have not been known until the publication of the Government blue book.

For the year the coal trade of Newcastle shows a very healthy advance over that of 1888, but it must be borne in mind that the output for the latter period was greatly affected by the general strike, which closed all the collieries with the exception of some four or five small ones for over three months. The figures for 1888 are taken from the Government returns, while the amount placed opposite "sundry small and tribute collieries" is approximate, there being no complete record obtainable. It is, however, based on careful calculations, and is well within the amount. With this exception the figures are authentic. The returns from each colliery, which include small coal, are in all cases taken from the quantities invoiced, and not from the miners' weights. The following are the outputs of the various mines:—

ASSOCIATED COLLIERIES.

	1889. Tons.	1888. Tons.		1889. Tons.	1888. Tons.
Wallsend	422,030	372,743	Co-operative	159,430	172,256
A.A. Company	280,944	270,976	Hetton	56,248	22,287
Lambton	245,507	164,048	Ferndale	41,091	14,871
Newcastle	226,893	105,750	New Lambton	30,698	64,237
Brown's	209,583	156,618			
Burwood	185,815	106,853	Totals	1,858,239	1,450,639
NON-ASSOCIATED.					
Stockton	201,000	182,480	Several small & tribute collieries (approx.)	150,000	159,198
W. and B. Island	170,000	68,240			
Greta	161,995	99,109	Total	805,933	616,403
Great Northern	72,038	61,479			
Waratah	50,900	45,897	Grand totals	2,664,172	2,067,042

Increase for 1889, 597,130 tons.

In 1887, 2,243,792 tons were raised; in 1886, 2,178,116; 1885, 2,113,372; 1884, 2,055,342. It will thus be seen that the increase in 1889 is the largest yet recorded, and to find anything approaching it we have to go back to 1883, when the increase over the previous year was 330,103 tons.

Of the quantity raised last year no less than 2,091,582 tons were shipped to foreign and intercolonial ports, leaving 572,590 sold within the colony. In 1888 this colony consumed 486,705 tons of Newcastle coal; in 1887, 585,416; and in 1886, 633,422 tons.

The following figures show quantity of coal shipped from Newcastle for foreign and intercolonial ports during the past 10 years:—

Year.	Tons.	Value.	Year.	Tons.	Value.	Year.	Tons.	Value.
1879	860,275	£591 090	1883	1,359,505	£722,428	1887	1,658,386	£886,921
1880	673,393	372 378	1884	1,505,395	835,070	1888	1,580,337	780,291
1881	899,369	343,931	1885	1,552,136	832,495	1889	2,091,582	1,027,221
1882	1,080,446	527,575	1886	1,544,694	828,189			

MINES IN COURSE OF DEVELOPMENT.

The Maitland Colliery.

As before stated, there are at the present time eighteen new collieries being opened out in the Northern district, and having already reviewed those in actual work, the larger ones in course of being developed will now be dealt with. It is interesting to note at this juncture that in spite of the depression which at present exists in the coal trade, the measures of this district still continue to attract capital. At no time in the history of Newcastle have there been so many collieries opening out together, or so much money spent in developing the various estates, as at present. When those now in course of sinking are in full swing the capable output of the district will be over three million tons a year, or an increase of nearly 40 per cent. upon the present quantity raised. Besides this, boring is going on in all parts of the country, and the discovery of seams is almost a weekly occurrence.

The existence of the Greta coal measures was proved some two years ago close to the town of West Maitland, and no sooner was it found than numerous companies were floated to take up land. The late Mr. W. B. Bradley and Mr. G. O. Hyde secured 537 acres of land half a mile from West Maitland, of which 162 acres are freehold, and the remainder under a mineral lease. Here they determined to establish a colliery, and having proved the existence of the seam, they commenced sinking in the beginning of 1889, at a point within two chains of the Great Northern Railway, exactly 20 miles 4 chains from the port of Newcastle. The Greta seam outcrops from the small hills, or downs, round the property, but the firm decided to sink to the dip in preference to tunnelling, so as to catch the coal on the rise, and lessen the cost and labour of underground haulage. The shaft is 14ft in diameter, and is bricked for a depth of 60ft. when hard grey post rock and conglomerate were struck. This continues for a depth of nearly 240ft, the shaft at present being down 320ft. Coal is likely to be struck at any minute, and sinking operations are going on night and day.

With a view of commencing to win coal as soon as the seam is found, the firm have erected a large and complete plant round the mouth of the shaft which will be capable of dealing with 900 or 1000 tons of coal per diem. The main colliery building is

constructed of ironbark, the landing stage or platform being 120ft long by 80ft wide; the whole being very substantial and extensive. A complete winding plant, consisting of a 20 horse-power engine, supplied with steam from two steel shell boilers, is placed in a brick building close to the colliery shed, and is in readiness for work at any moment. Arrangements are being made for another engine to be placed near the first, and the shaft will be fitted with double cages of the latest pattern.

The mine is approached from the Government railway by double loop lines entering on the west side of the main shaft, and connecting again with the railway on the east. The screens, which number three, are already in position, while a large number of hopper waggons are being constructed. Owing to the excellent site of the colliery, which is on an eminence overlooking the valley of the Hunter, there has been a large demand for land in the vicinity. The firm has laid off a township 80 acres in extent on the other side of the railway, and erected twenty houses. The township is called Homeville, and when the mine is in full swing the firm intend erecting a great many more houses upon the same excellent plan as those now on the ground, so that their miners will be able to secure dwellings at equitable rents.

The seam existing under the land as proved in bores and a small shaft is the same as that worked at the famous Greta Colliery, the only difference being that it is even thicker. At the bottom of a trial shaft sunk within a quarter of a mile of the colliery the seam was found to be 21ft, 7ft. of it being a very rich cannel coal. This latter mineral is a most valuable deposit, one ton of it giving 12,000 cubic feet of gas, or over a fourth more than can be obtained from the best bituminous article. Some idea of the value of such a seam may be gleaned from the fact that the Greta Company found a small seam under three feet and worked it out. The value of true cannel coal, which up to the present has not been found in any large quantities in the district, is £1 per ton, while the hewing price is the same as for common coal. Should this seven feet obtain under the whole estate, and there is very little reason for doubting it, its value will be enormous, and in consequence the opening of the seam is causing no little interest.

An analysis of the cannel coal gives the following result:—Moisture, 2·27 per cent.; volatile hydro-carbons, 35·39; fixed carbon, 53·91; ash, 8·43; the specific gravity being 1·35. The other coal in the Greta series is very hard, minutely laminated, and is streaky rather than uniform in appearance. Its great hardness makes it very suitable for shipping, and for gas purposes it has no equal in Australia. The average specific gravity is 1·275, and the average composition of the coal taken at differ-

ent parts of the area is about as follows:—Moisture, 2 per cent.; volatile hydro-carbons, 41; fixed carbon, 51·20; ash, 4·60; sulphur, 1·20.

Mr. G. O. Hyde, of Newcastle, has the management of the firm, while Mr. Thomas Cater is the manager of the colliery.

South Greta Coal Company.

WITHIN half-a-mile of the Maitland Colliery, and adjoining the estate on the north and west, is the land of the South Greta Coal Company. It was formed in 1887, with a capital of £80,000 in 80,000 shares of £1 each, which a few months ago was increased to £120,000. The property of the company now consists of 1335 acres, of which 465 acres are freehold, the balance being held on a mineral lease.

The colliery first known as Homeville was opened in 1887, the company driving a tunnel into the outcrop in a north-western direction, close to the Great Northern Railway, a half-mile west of the Maitland mine. Although some 5900 tons were won from this mine in 1888, yet it can be classed as an opening colliery, the main headings and tunnel only being now completed. For some time past the mine has been shut up, the company finding that it would not pay to draw coal from their freehold estate through the leased area, thus having to pay a royalty for their own mineral. Negotiations are, however, pending for the purchase of the land, and the company will then resume work. The miners in the meantime are locked out, and are supported by the association.

The plant at this colliery is very complete, and capable of drawing 400 tons per day, the underground haulage being accomplished by a main rope, the empty skips finding their way to the bottom of the tunnel by gravitation. The main tunnel is at present nearly 300yds in, the seam being 5ft in thickness increasing as the headings progress. A second tunnel close to the first, but entirely separate, was driven into the cannel seam, which was also found in this mine. It is 4ft in thickness, increasing towards the east. and the coal mined from it realised a high price. When the skips are drawn from the tunnel they reach the platform, which is a very large one, where the coal is tipped over one of two common iron bar screens on to the railway waggons beneath. The coal from the cannel seam is drawn on to a different platform, where there are two other screens. The company have a double siding from the Great Northern Railway, 40 chains long, and are in a position as soon as opportunity offers to send out large quantities of coal. They have at present some 80 steel and wooden hopper waggons, the Government hauling the coal to port at a fixed rate per ton.

The Hon. E. Vickery, M.L.C., is chairman of the company, the resident director and promoter being Mr. G. O. Hyde. The head office is in Sydney, where Mr. Brentnall, the secretary, resides, the colliery being under the management of Mr. Edward White.

The East Greta Colliery.

DURING the early part of 1889 Messrs. H. J. Adams, R. A. Young, O. K. Young, and P. W. Waddy purchased 250 acres of coal-bearing land, due south of West Maitland, and, after proving the existence of the seam, proceeded to establish their colliery. The site chosen is two miles ten chains from the Great Northern railway, and a large tunnel is now being driven into the outcrop. All the necessary plant for drawing out 500 tons per day is being erected, the syndicate sparing no expense to fit the mine with all the latest appliances. Hauling engines of 200 horse-power are on the ground, but no coal has yet been put into the market, the means of railway communication not having been finally settled.

The Maitland—Silkstone Colliery railway, the construction of which was recently sanctioned by the Government, will pass through the East Greta estate, and the syndicate purpose connecting their mine with it. The seam is somewhat different from that in the Maitland and South Greta collieries, being of unusual thickness, and separated by many feet of rock. The lower portion, which is 12ft thick, is supposed to be the No. 1 Greta seam, while the upper section is of slightly inferior quality, and more adapted for steaming purposes. It is much thicker than the lower section, averaging 30ft in places, both seams, or rather sections, dipping to the south-east. Mr. H. Cartwright is the colliery manager, the head office of the syndicate being in Maitland.

Richmond Vale Coal Company.

In 1888 a Melbourne syndicate purchased the Richmond Vale Estate, lying some 10 miles south of East Maitland, and consisting of 4,600 acres of undulating country. It was originally the property of Mr. John Scholey, of Waratah, and was sold by him to the syndicate mentioned. Boring operations were commenced in October of the same year, and after some hard and tedious work

the existence of a 14ft. 6in. seam of coal was proved, and, on the recommendation of the company's mining expert, a shaft was started about 1¼ miles from the bore, the object being to sink to the dip of the country and avoid underground haulage when the mine was opened out. The shaft is 14ft. in diameter, and during the first week of 1890 coal was struck at a depth of 689ft. There are two seams of coal on the estate, one proved by the Silkstone Company and a second of 17ft. 6in. in thickness proved by Trenchard, Adams, and Co. This latter is the No. 1 Greta seam, and in all probability is identical with that found in the shaft. A large colliery plant is in course of erection, and all appliances will be obtained to enable the colliery to have an output of 750 tons per day. The syndicate have not yet decided as to a railway route, there being two courses open, namely, to connect with the West Wallsend Coal Company's line to the east of them, or construct a private railway to join with the Great Northern at West or East Maitland.

The West Wallsend Coal Company.

THE West Wallsend Coal Company was formed in Sydney, in the year 1885, with a capital of £90,000, in 90,000 shares of £1 each. They secured 2,972 acres of freehold land, which is hilly and thickly studded with timber. It is bounded on the east by the estates of Messrs. J. and A. Brown, the Newcastle-Wallsend Company, and the Young Wallsend; on the south by the Teralba Colliery, and on the north and west by the Monkwearmouth Coal Company.

The company, having proved the existence of the Borehole seam, commenced in the latter end of 1885 to establish a colliery. Although it was opened in July, 1887, yet it can only be classed as an opening mine, as—owing to the general strike in 1888 and a dispute between the company and their miners, which was only terminated in January, 1890,—the work of developing the mine has been greatly retarded. The winding shaft is 15ft. 6in. in diameter, 492ft. deep, and fitted with double cages which hold two skips each. The main colliery building is very complete, the pit-head being of steel, while the poppet-head is 71ft. from the ground. No timber has been used in the works except where absolutely necessary, and the buildings are in consequence very substantial. Winding is accomplished by two powerful engines, with 23in. cylinders, 4ft. 6in. stroke, the winding drum being 12ft. in diameter, tapering to 10ft. at the ends. This machinery

is placed in a brick building, 52ft. by 32ft., steam being supplied from four steel boilers, each 30ft. long with a diameter of 5ft. 6in., placed in a separate structure, which is flanked by a smoke-stack 80ft. high. When thoroughly opened out and in full work the mine will be capable of raising 1,000 tons of coal per day, and there is no doubt but for the prolonged unfortunate difficulty between the company and the men large quantities of coal would be won from this mine. A ventilating shaft has been sunk some 30 yards from the main one, and a powerful horizontal condensing pumping engine is also erected at the surface, which is more than sufficient to keep the workings dry.

The Borehole seam in this colliery contains a very large number of bands, but 4ft. 7in. of the bottom, only containing two bands, is worked, the remaining portion being left standing. When the colliery was working good progress was made with the drives and headings, the output in 1888 being 7,645 tons. The company then had 90 men at work, but since the beginning of the general strike in September, 1888, no work of any consequence has been done.

For the purpose of getting their coal to the port the company have constructed five miles of private railway, which branches off the Sydney-Newcastle line at Cockle Creek, which is ten miles from the shipping cranes on Bullock Island. The cost of the railway was over £16,000, and for two miles of its length it passes through land purchased for its construction by the company. They haul the coal waggons from the mine to Cockle Creek by their own engines, the remaining distance to Newcastle being done by the Government at a cost of 1s. 1d. per ton.

The mine was opened in the first place by Mr. Thomas Evans, and Mr. Neilson is the present colliery manager. The head office is in Sydney, the local shipping manager being Mr. Goldsmith.

The Monkwearmouth Colliery Company.

THE estate of this large company consists of 4,475 acres of leasehold and freehold land, situated to the north of the West Wallsend property, and west of Minmi. It includes a large water reserve, the company having obtained the right to mine at the usual royalty of 6d. per ton on round and 3d. per ton on small coal. The capital of the company is £150,000 in £1 shares, and some £50,000 have been spent in developing the estate. One large winding shaft, 17ft. in diameter, and an air pit have been down to the Borehole seam, a depth of some

420ft., some months, and main headings now connect the two. These shafts have been sunk on a freehold section near the south-east corner of the estate, and at present the mine is well opened out, single headings having been driven in all directions. A large colliery plant has been erected, and some few thousand tons of coal have already been shipped. The pit-head frame is on the iron lattice principle, the pulley wheels being 15ft. in diameter Two large winding engines (26in. cylinders by 5ft. stroke, with 14ft. conical drums), to work on the first motion, have been erected, and everything is in readiness to send out some 400 tons of coal in eight hours, which may in a few months be increased to 750. The coal seam in this mine is somewhat disturbed by faults, the main shaft having struck a remarkably hard basalt dyke soon after touching the coal, which required to be cut and opened out at enormous cost. In the headings, which at the end of 1889 extended some 1,200 lineal yards, the seam shows some 5ft. 9in of coal, with four half-inch bands. Considerable quantities of inflammable gas have been met with in this colliery, necessitating extreme caution and the use of safety lamps. An explosion took place in December, 1889, which caused the death of one man, besides severely injuring a second, and, so far, this has been the only serious accident from gas in the northern district. As the seam becomes opened the danger from fire-damp will be greatly minimised, and at present the company are erecting a large fan, in place of a furnace, for ventilating purposes, as the former method cannot with safety be employed. The arrangements for taking the coal to the port are now complete, the West Wallsend Railway, in which the company have an interest, having been continued from that colliery to the Monkwearmouth pits, a distance of some seventy chains. There are at present sixty steel hopper 8-ton waggons in use, and some forty additional ones are being constructed. Mr. Samuel Barr is the manager of the colliery, and Dr. Robertson consulting engineer, the Newcastle shipping office being under the charge of Mr. Goldsmith.

The Young Wallsend Coal Company.

THE Young Wallsend Coal-mining Company was formed in 1887, with a capital of £67,000, in 67,000 shares of £1 each. The estate consists of 950 acres of freehold land, situated three miles south-east of the township of Wallsend, and is bounded by the lands of the Newcastle-Wallsend, Minmi, West Wallsend, and Teralba Coal Companies.

The work of opening out the Young Wallsend Colliery has been accomplished with a dispatch which reflects considerable credit on the directors and officials. In December, 1887, the work of sinking the mine was commenced, and the shaft has been put down to the Borehole or Wallsend seam a depth of 530ft. At the bottom, headings are driven north and south, with a height of 7ft 6in, and having a width of 5 yards. These have been opened thirty-three yards each side of the pit, and timbered every 4ft. At a distance of twenty yards from the shaft, main headings have been driven 20ft each way, east and west, to open out the mine The pit at present is ready to start work with thirty-six miners, and as it opens out more will of course be required. The slides and buttings in the shaft are all ready to receive the cages, which have been constructed on the premises, and are now ready for work. Platform, screens, and kickups are also all completed, and only waiting further developments before being used. The main winding engines, having 26-inch cylinders and 4ft stroke, are also in working order. The horse power of the engines is 80 nominal or 130 effective. An engine-house of brick, 41ft by 32ft, is completed, and the boilers are now roofed. The shaft being sunk to the lowest point of the dip causes a slight rise from it each way, and in consequence the underground haulage in the mine will be effected without much difficulty.

There are two seams in the mine, and the bottom one, which is to be worked, is 7ft in thickness. An analysis of the coal gives—Moisture, 2·02 per cent.; volatile hydro-carbons, 35·05; fixed carbon, 57·00; ash, 5·93; and for coke, 62·93; specific gravity, 1·32; and sulphur, ·578. Above this is another seam 10ft deep with 7ft 6in of workable coal. This is driven in twenty yards north and south, and the quality of the coal is stated to be excellent. Stables and paddocks are in the vicinity. The company make their own bricks on the ground, and carpenters' and blacksmiths' shops are also at work preparing the plant necessary for opening out the mine. About 30 men and boys are at present engaged on the ground, and in the first week in March, 1890, the colliery will be in full swing.

The company have constructed two miles and a quarter of private railway, branching off from the Newcastle-Sydney line at a point nine miles south of the Bullock Island cranes. The culverts, cuttings, and general formation are of a substantial character, and should meet the requirements of the company for a very long time to come. At the end of the line are three sidings and a long dead end, everything being laid out to give the greatest facility in dispatching coal to the shipping. Room is provided for about 100 trucks to stand near the pit, and four train loads of filled trucks could be placed there so that they would not interfere with the traffic on the branch line.

Since the commencement of sinking operations the value of the land has enormously increased, many portions of the estate which had been bought out and out for £15 per acre having been cut up by the company and sold (surface only) at £200 per acre.

The head office of the company is in Newcastle, Mr. J. C. Bonarius being the chairman, and Mr. John Clark the secretary. Mr. Fairley is the colliery manager, and resides at the township which is fast springing up around the mine.

The Newcastle New Wallsend Coal Company.

THIS company was formed in the year 1888, with a capital of £110,000, in 110,000 shares of £1 each, for the purpose of acquiring 2560 acres of freehold land in the parish of Teralba, and situated to the south of the West Wallsend coal company's estate. A shaft 16ft in diameter was commenced soon after the formation of the company in the centre of the estate, at a place called Apple Tree Flat. Sinking operations have since that date been carried on vigorously, and at a depth of 375ft, a seam 9ft in thickness was struck. Work was, however, continued with a view of striking the Borehole seam, which was proved by a diamond drill to exist under the property at a depth of 700ft. At present the shaft is down some 420ft, and the erection of a large and complete colliery plant is being proceeded with. When in full swing the mine will be capable of raising 1000 tons of coal per diem, and no expense is being spared to thoroughly develop the estate, which is undulating in character and well timbered. A line one mile in length branching off the West Wallsend private railway at a point some 90 chains from Cockle Creek, now connects the colliery with the port, and the company expect to be in a position to send out coal by the beginning of 1891. Mr. R. B. Wallace, of Newcastle, is the managing director, and Mr. Percy Smith the secretary.

The Northumberland Coal and Land Company.

THIS company is one of the largest yet formed for the purpose of developing the coal measures of the northern district, having been registered in London in 1885, with a capital of £200,000.

An estate of 2,560 acres, situated in the parish of Awaba, county of Northumberland, was purchased, and steps taken to establish a colliery, which was intended to surpass any in the district. Its eastern boundary fronts the Homebush-Waratah railway 11 miles from the port, Cockle Creek forming the northern limit. Mr. J. W. Crawford, mining expert, was sent from England, to open the colliery, and he brought with him probably the most expensive and complete plant ever landed in Australia. Two huge shafts, each nearly 20ft in diameter, were commenced half-a-mile from the railway, without the seam even being proved by a diamond drill, a want of foresight which cost the company many thousands of pounds. The pits were known by the names of Bryant and Trummer, and for many months sinking operations went on with almost feverish vigour. The shafts and pits tops were lighted during the night by electricity, and it is noteworthy as being the first colliery in New South Wales where the light has been used for sinking and other purposes. A Schiele blowing fan 5ft 6in in diameter, with canvas pipes attached, was used for ventilating the shafts, while the work of erecting the huge plant was proceeded with as soon as the sinking was commenced. An adit was driven in the outcrop of one of the upper seams to supply the engines with fuel, and for a long time things at the colliery were booming, the construction of a railway line giving employment to many hands. The Bryant shaft was sunk to a depth of 495ft, and the other was down 465ft, without reaching any coal, and then a change came over the affairs. The manager was recalled, and for a time the place, where some £100,000 had been spent in work alone, was deserted. At present one of the two upper seams which exist on the estate is being worked by the company's manager, Mr. Pease, and some months ago, a diamond drill was put down at the bottom of the Bryant shaft, After many weeks work the Borehole seam was struck at a depth of 605ft, making a total from the surface of 1100ft. The drill showed 4ft 5in of clean bituminous coal, and the intelligence was cabled to England. It is now proposed to increase the capital by £50,000, and sink the shaft to the seam, and if this is done, it will be by far the deepest colliery in Australia. In the meanwhile the magnificent plant which was intended to raise 2000 tons of coal per diem, is lying idle, and it is to be hoped that the English shareholders will make another attempt to establish the colliery, now that the seam has been proved. Mr. J. Pease, a mining engineer from Staffordshire, has the management of the estate.

The West Burwood Colliery.

IN the beginning of 1889 this colliery, which is the property of Messrs. J. M. Rooke and J. C. Berger, was opened on 200 acres of the Merewether estate near the Glebe. The proprietors hold a sub-lease from the Newcastle Coal Company, and are working the upper or Burwood seam from two tunnels driven into the hills. At present there are over 50 hands employed, and the coal is taken to port over the Newcastle Company's private line. The firm have secured contracts to supply coal to several large steamship companies, and the colliery has for some months been unable to supply the demand. The head office of the firm is in Scott street, Newcastle.

South Burwood Coal Company.

THE South Burwood Coal Company, Limited, was formed in 1885 with a capital of £100,000 in 100,000 shares of £1 each. The estate embraces an area of about 1200 acres, part of which is on a mineral lease from the Government, but the greater portion is freehold. It fronts the ocean about five miles south of Newcastle, and is bounded on the south by the Scottish Australian Mining Company's Durham estate, on the north by the Burwood colliery, and on the west by a portion of the Waratah coal land. Sinking operations were commenced on the 1st November, 1888, at a place known as Little Redhead, and on the 20th of November, 1889, the Borehole seam was struck at a depth of 625ft. There is 200ft of hard conglomerate over the coal, with a thick interposing strata of gray hard rock. The seam is 6ft in thickness and contains two small bands.

The colliery plant is at present being constructed, and, when completed, the mine will be one of the largest in the district. A pair of permanent winding engines on the coupled horizontal principle, capable of exerting a power equal to 200 horses, have been erected. Steam will be supplied to them from three large Cornish boilers each 6ft in diameter, while the winding drum is conical in shape, and from 12ft to 14ft in diameter. The machinery is built on cast-iron tank pillars resting on solid concrete foundations; the buildings being of brick, and fitted with all the latest improvements. The chimney stack is 95ft in height,

and stands on an eminence 350ft above the level of the sea. Now that the coal has been reached the work of pushing in the winning headings will be rapidly proceeded with. The permanent pit-head frame and other gear have arrived, and are now in course of erection. The whole pit-head structure will be 76ft in height, and fitted with 16ft pulley wheels, making a total depth of 720ft to the bottom of the shaft.

A railway 4 miles 31 chains in length is being constructed by the Redhead Coal Company to tap several large estates between Adamstown and the entrance to Lake Macquarie, and arrangements have been made by which the coal from South Burwood will be taken to the port by that route. A branch line is being constructed for a distance of one mile, and the company expect to be raising coal about June, 1890, the railway having to be completed by May.

Some two days after coal had been struck in the main shaft, a fearful calamity happened, by which three sinkers lost their lives. They had got into the bucket at the bottom, and were drawn up to a Tangye pump, where they stopped and put on steam so that the water would be kept down. They then gave the signal to the engine-driver to resume the winding, and, missing the token on the rope, which was the only means he had of knowing the position of the bucket, he omitted to stop the machinery when the men reached the top of the mine. The consequence was that the bucket struck the poppet head, and, the sudden strain smashing the drum, the poor fellows fell right to the bottom of the shaft, a total distance of nearly 640ft. As may be imagined, they were fearfully mangled, each of them having lost a leg owing to the sharp rim of the bucket, over which it is customary for miners to sit.

The mine is under the management of Mr. A. Gardiner, while Dr. Robertson is consulting engineer, and Mr. Harper chairman of directors.

The Durham Colliery.

THE Scottish Australian Mining Company, with a view of greatly increasing their already enormous trade, in 1886 obtained, on mineral lease from the Government, 3,214 acres of land, situated at Redhead, which is nine miles from the port of Newcastle. The estate is bounded on the north by the South Burwood land, on the south by the Burwood Extended, while the ocean forms the eastern limit. A main shaft 16ft. in diameter has been put down on that part of the land known as the Water

Reserve, No. 4, and the Borehole seam struck at a depth of 470ft. A deposit of quicksand and clay greatly impeded the sinking of the shaft, and for the first 70ft. it was found necessary to sink iron cylinders. After that, however, excellent progress was made, the strata passed through being much the same as that encountered in the South Burwood pit. Winning headings are now being driven in all directions, the seam being 5ft. 4in. in thickness, and containing only two small bands of 1in. and ½in. respectively. An extensive colliery plant, capable of raising 700 tons per diem is in course of erection, and a ventilating shaft is also being sunk. The company intend constructing a railway to join with the Homebush-Waratah line at Winding Creek, and expect to ship coal from this colliery in 1891. At present, however, the output from their Lambton mine is sufficient for the trade, but should the demand increase, doubtless the completion of the railway to the new pits will be hurried forward. Mr. Thomas Croudace has superintended the opening of the mine, and is confident of one day making it equal to the Lambton colliery.

Burwood Extended Coal Company.

THE Burwood Extended Coal Company was formed in 1888, with a capital of £120,000 in 120,000 shares of £1 each, for the purpose of mining coal, at a royalty, from under 1,000 acres of the northern part of the Redhead Company's estate. They have also secured the right to mine some 1,200 acres of the ocean bed, and intend pushing winning headings under the sea as soon as possible. One shaft has already been sunk to the Borehole seam, a depth of 471ft.; while a second, which is 20ft. in diameter, is now down some 300ft. Winning headings have been driven from the bottom of No. 1 shaft, the seam being identical with that in the South Burwood and Durham collieries, being 5ft. 4in. in thickness. A complete colliery plant is now being erected, and when in full swing the mine will increase the district output by some 1,000 tons per day. The Redhead Coal Company's railway passes the colliery, and the coal will be sent to port by that route. Mr. Wilson Rennie, a certificated manager from Scotland, has charge of the mine; the consulting engineer being Dr. Robertson.

The Redhead Coal Company.

THIS is one of the largest companies yet formed to mine coal in the northern district of New South Wales. It has a capital of £150,000 in 150,000 shares of £1 each, and was floated in 1888. The estate consists of 4,300 acres of freehold, which extends from the southern boundary of the Scottish Australian Mining Company's Durham estate, along the coast nearly to the entrance of Lake Macquarie. Sinking operations have not yet thoroughly commenced, but the existence of the Borehole seam has been proved on various parts of the property. The company are now constructing, at enormous cost, some six miles of railway, which branches off the Homebush-Waratah line at Adamstown, nearly four-and-a-half miles from the port of Newcastle. This line will tap the South Burwood and Burwood Extended collieries, and will be constructed to a spot where the company have decided to establish a mine. It is proposed to extend it another six miles to the small township of Kahibah, which is situated close to the entrance of Lake Macquarie, the route having been already surveyed.

The Wallarah Coal Mining Company.

THE Wallarah Coal Mining Company was formed in London in September, 1888, with a capital of £100,000 in 10,000 shares of £10 each, for the purpose of acquiring a large tract of coal-bearing country, then the property of Messrs. Parbury, Saddington, and Lamb. When 1,200 acres of the estate were offered to the capitalists concerned, the present manager, Mr. Thomas Parton, F.G.S., was sent out to report, and, his reply being favourable, the property was purchased, and steps at once taken to establish a colliery. The land extends from Swansea to Catherine Hill Bay, and has a frontage of some three miles to the ocean, the lake forming a part of the western boundary. It is moderately hilly, and thickly studded with timber, most of the trees being remarkably fine ones. The existence of three seams of coal all cropping out along the sea slope has long been known, and some years ago the No. 2 was worked from a tunnel on the sea beach, close to where the company have erected their wharf. A second tunnel exists near Swansea, where the coal for the

Government dredges and the contractors locomotives is obtained. With these exceptions, however, very little had been done to develop any of the Lake Macquarie seams until the Wallarah Company commenced operations.

The establishing of a large colliery in such a secluded spot was naturally a very difficult undertaking, as in 1888 there was only what may be termed a bridle track running from Swansea, a little village at the entrance of Lake Macquarie. The first thing undertaken by the manager was the selection of a site for the colliery, and after mature consideration it was decided to tunnel in No. 1 or upper seam, at a point some 2½ miles north-east of the bay. Here a large adit was driven far enough into the outcrop to thoroughly prove the seam, and so in a measure justify the expenditure of the large sum of money necessary to open it out.

As Catherine Hill Bay is very exposed, great care and foresight had to be exercised in the construction of the wharf, and there were not wanting people who prophesied that nothing but speedy failure awaited the company which was rash enough to attempt to ship coal from the place. At the south end of the bay is a headland jutting out into the sea, where it ends in a rocky reef, and so affords excellent shelter for a considerable expanse of water, from at any rate all southerly weather. The work of throwing out a wharf was commenced as soon as the company had been formed, authority having been cabled out from London. As the bottom was nothing but rock, every pile used had to be fitted with an iron bolt at the end, which was drilled into the rock by divers. At the present time this wharf runs out for a distance of 1,020ft, the planking being 30ft above high water mark, so as to enable vessels of 3000 tons to coal at the shoots. It is fitted with two shoots, which can be adjusted to suit the state of the tide or the size of the ship, and it is estimated that 1000 tons of coal can be shipped in eight hours. To protect the structures during heavy easterly gales four large iron cylinders are to be sunk at the end, while near the shoots are two fenders connected with separate piles, so that the rolling of a vessel will not damage the main structure. The depth of water at the shoots is from 25ft to 35ft at low water, and as this amount exists for nearly 600ft there is ample room for the largest steamer. The railway is now completed right from the wharf to the colliery, and it is certainly one of the best laid lines in the northern district, the rails being of steel, weighing 70lb to the yard, while it is well ballasted and secured. The company have at present some 100 hopper-shaped iron waggons, which are made with opening bottoms. They are also exceptionally large, holding 12 tons of coal without being heavily topped, and were made in England, being sent out in segments, and fitted up at the place. One of

the first acts of the company was to erect a sawmill, and nearly all the timber used, both in the works and in the buildings, as well as the railway sleepers, was procured from the estate.

The mine is two and a half miles from the wharf, and is situated on a hill some 250ft above the level of the sea. A tunnel 10ft by 12ft was commenced in August, 1889, and it goes into the outcrop in an easterly direction for some 300yds. The seam is a somewhat peculiar one, being 8ft in thickness, with no band or parting of any kind, and owing to its peculiar formation it is very easy to hew. Above it is a small band, and then another 2ft of coal, but the latter portion will not be worked. The mode adopted in opening the colliery is somewhat different from the course generally obtaining in this district, the intention of the manager being to drive right to the end of the coal, and then take it back. It will be a modification of the long wall system, and the advantages claimed are many, the principal one being that there is comparatively no waste. The present tunnel will serve for some three hundred acres of land, the seam as it were cropping out on either side of the hill. When this portion of the estate is worked out another adit may be driven into a second hill in a westerly direction, and as the railway runs between the two it will not need to be shifted. The mouth of the adit is some three hundred yards from the screens, but owing to the elevated position of the seam the skips find their way to them by gravitation, the full ones hauling the empties up the incline. At present the underground haulage is accomplished by horses. but as soon as the colliery is fully opened out, it will be effected by steam. Some 9ft below the No. I seam is another containing some 6ft of a very similar mineral, while still lower is a third, which, although also considerably above the level of the sea, is comparatively little known. They have a very slight dip to the south-west, and so far not an interruption of any kind has been met with It will thus be seen that the Catherine Hill Bay district has three coal seams peculiar to itself, while there is very little doubt but that the Borehole seam exists under the property at a great depth. A bore put down near the entrance to Lake Macquarie, close to Swansea, which is but six miles north of Catherine Hill Bay, some years ago, struck what is supposed to be the Borehole seam at a depth of 90[illegible]ft, but it was only some 4ft in thickness. Since the commencement of operations at Catherine Hill Bay the quality of the coal in the seams has been a matter of no little discussion and speculation. It is not a true bituminous coal, and is much inferior to the mineral from both the Borehole and Greta seams for gas making, but for steaming purposes it is considered equal to anything in the district. It is somewhat hard, only giving some 12½ per cent. of small coal, is streaked with bright bituminous mineral, and it is

claimed that owing to this it lights quickly, burns without clinker, and keeps its heat.

At present the company find employment for 120 men and youths, some 60 of whom are miners, receiving 10s per day of eight hours. For some time, however, they have wished to be put on at a tonnage rate, but the manager considers that until the colliery is properly opened and a trade fostered, it would be advisable for all parties if the present system was continued. The men, including nine who were brought out from England under a two years agreement, recently formed a miners' lodge, and have been admitted into the association, and are under existing rules nominally bound not to hew a ton of coal under the usual district price, which is 4s 2d per ton. Owing, however, to the different class of seam, the manager contends that it should be wrought for a price midway between the rates paid in the southern mines and in this district. In view of this the matter has not been settled, but negotiations are now going on which it is to be hoped will end satisfactorily to both parties.

On a beautifully undulating slope overlooking the bay the company have laid out a township, and have erected some 20 four-roomed cottages, each provided with a plot of ground, which the miners may obtain on lease. The inhabitants, however, have still a good deal to complain of, as there is practically no road worthy of the name connecting them with either Swansea or Wyee. The whole of the material required by the company was either taken to the head of the Lake in a ketch, and drawn overland by bullock teams, or taken from Wyee in the same manner. Now that the place is started it cannot be long before there is good communication with the outside world, and indeed the company have already prevailed upon the Government to vote some hundreds of pounds for the purpose.

The manager, Mr. Thomas Parton, F.G.S., is an ex-president of the South Staffordshire and East Worcester Mining Institute, and under his supervision the whole place has been laid out.

The Newcastle and Stockton Land and Coal Company.

THIS company, with a capital of £100,000 in 20,000 shares of £5 each, was floated in Melbourne in 1888, for the purpose of mining, draining, and developing a large area of coal bearing and agricultural land near Raymond Terrace, in the county of Gloucester, some eleven miles north-west of Newcastle. The estate consists of about 11,600 acres of freehold and 9,400 acres of leasehold, which gives the company a larger area than any other

in the northern district. Several seams of coal have been discovered on the property, and they are believed to belong to the East Maitland and Greta coal measures. Bores have been down in different parts of the estate, and a good seam having been found the company, some months ago, commenced sinking operations. They purpose establishing a large colliery, and as the eastern boundary of the estate reaches within two miles of the navigable branches that form part of Port Stephens, and is also close to the Hunter River, the coal will be shipped without carrying it to the port of Newcastle. The head office of the company is in Melbourne, where Mr. L. Levinson, the secretary, resides.

CONCLUSION.

THIS practically concludes the list of the important collieries already working or being opened out in the northern district of New South Wales. There are several other companies either being floated or commencing sinking operations, but they are not sufficiently developed or are not of such importance as to warrant their inclusion in this work.

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