THE BRITISH OXYGEN COMPANY LIMITED.

GENERAL PRICE LIST
(ALL PREVIOUS LISTS CANCELLED)

FOUNDED · IN · 1886 · AS

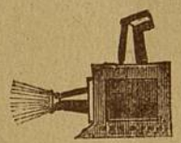
BRIN'S OXYGEN COMPANY LD.

ADDRESSES.

LONDON WORKS AND HEAD OFFICE: Telephone: WESTMINSTER, 206. Two lines. Telegraphic Address: "BRIN'S OXYGEN," LONDON.	ELVERTON STREET, WESTMINSTER.
BIRMINGHAM WORKS: Telephone: No. 87, EAST BIRMINGHAM. Telegraphic Address: "BARYTA," BIRMINGHAM.	SALTLEY WORKS, BIRMINGHAM.
MANCHESTER WORKS: Telephone: No. 2538, MANCHESTER. Telegraphic Address: "OXYGEN," MANCHESTER.	GREAT MARLBOROUGH STREET, MANCHESTER.
NEWCASTLE WORKS: Telephone: No. 3239, CENTRAL. Telegraphic Address: "OXYGEN," NEWCASTLE.	BOYD STREET, NEWCASTLE-UPON-TYNE.

1909.

No 160

REGISTERED  TRADE MARK.

— Price List No. 160 —

Awarded Gold Medal Franco-British Exhibition, 1908.

THE BRITISH OXYGEN CO., LD.

TERMS.

Customers who have not a credit account with the Company should remit cash with order, and deposit the value of the Cylinders or furnish references. The deposit will be refunded on return of the Cylinders to the Company's Works from which they were supplied, carriage paid and in good condition, less any rent charges which may have accrued (*see page* 3).

DELIVERY.

LONDON. Gas is delivered free within five miles of Charing Cross in quantities of 20 feet and upwards; on smaller quantities Customers will be charged for carriage. The Company have arranged with Messrs. Carter, Paterson & Co. that all Cylinders delivered full by them will be collected empty *free of charge*. On Cylinders returned by other means than the above, carriage must be prepaid.

BIRMINGHAM. By special arrangement with Messrs. Pickford & Co., Cylinders are delivered and collected free within two miles of Stephenson Place, which contain gas in quantities of over 5s. in value; on smaller quantities Customers will be charged for carriage.

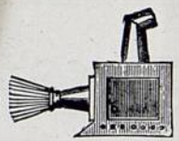
MANCHESTER. The Company do not pay carriage on Cylinders except by special arrangement.

NEWCASTLE. The Company do not pay carriage on Cylinders except by special arrangement.

RAILWAY RATES.

Oxygen Cylinders are conveyed by the Railway Companies by goods train at the same rate as mineral waters (Class 2), and in Cylinders up to 40 cubic feet capacity by passenger train at ordinary parcels rate. Returned empty Cylinders are conveyed at reduced rates by goods train, but the full parcels rate is charged on empty Cylinders returned by passenger train. Cylinders consigned by rail, whether passenger or goods, must be packed in cover or case as specified by the Railway Companies (*see page* 4).

THE BRITISH OXYGEN CO., LD.

REGISTERED  TRADE MARK.

General Price List.

COMPRESSED GASES.

OXYGEN.

	In the Company's Cylinders.	In Customer's own Cylinders.
Quantities of less than 20 cubic feet	4d. per cubic foot	3d. per cubic foot
Quantities of 20 cubic feet and less than 60 cubic feet	3d. ,, ,, ,,	2½d. ,, ,, ,,
Quantities of 60 cubic feet and upwards	2½d. ,, ,, ,,	2d. ,, ,, ,,

NITROGEN supplied at same prices as above.
HYDROGEN supplied at same prices as above.
COAL GAS supplied at ½d. per cubic foot less than above prices.
NITROUS OXIDE—For Particulars see Special List.
CARBONIC ACID—For Particulars see Special List.
ACETYLENE—For Particulars see Special List.
LIQUID AIR—For Particulars see Special List.

Special Terms to the Trade and Large Consumers.

Trade Mark.—The Company beg to draw the attention of their Customers to the above registered Trade Mark. All Cylinders filled by the Company (whether their own or their Customers') are labelled with this Trade Mark. The label guarantees the purity of the gas, and is a further guarantee that the Cylinder has been tested and proved sound by the Company in accordance with their regulations. The label is also stamped with the date on which the Cylinder was filled.

Caution against Oxygen of Inferior Quality.—Customers requiring Oxygen for inhalation should be particularly careful to procure Oxygen which is abstracted from the atmosphere, and which consequently contains no corrosive or deleterious impurities.

Order Forms.—To ensure the accurate execution of Orders, the Company supply Order Forms free of charge, which for the convenience of Customers are printed in copying ink.

SEAMLESS STEEL CYLINDERS.

* Cubic Contents in feet.	Approximate external diameter in inches.	Approximate length over all in inches, including valve.	Approximate weight in lbs. (empty).	Price of Cylinders with Valve.	Rent per week after first 14 days.
† 6	4	14	10	**26/6**	
10	4	19	13	**28/-**	
12	4	23	15	**29/6**	**1/3**
15	4	27	18	**31/-**	
20	4	35	23	**33/-**	
40	5½	36	45	**49/6**	
60	5½	50	66	**59/6**	**1/6**
60	7	32	66	**68/-**	
80	7	41	88	**79/-**	**2/-**
100	7	49	110	**93/-**	**2/6**

* *All Cylinders are filled to a pressure of* 120 *atmospheres.*
† *This size of Cylinder cannot be hired.*

All Cylinders sold or employed by the Company are guaranteed to be made of steel complying with the British Government recommendations. They are made to the Company's own Specifications, and are regularly inspected during manufacture by one of the Company's Engineers. They are all re-annealed, valved, and tested hydraulically to a pressure of 1½ tons per square inch, in the Company's Works, before being filled with gas. The Company's methods of annealing, testing and filling Cylinders are in accordance with the British Government recommendations (*see page* 4).

Ordering of Cylinders.—Oxygen, Nitrogen, Hydrogen and Coal Gas are supplied in any of the above Cylinders, subject to the terms stated on page 1.

When ordering gas Customers are requested to state clearly the size of Cylinder required, also whether they require fittings, and if so to specify them.

All fittings are interchangeable, that is to say, they can be attached to any size of Cylinder valved with the standard type of valve for the gas which it contains (Figs. 3 and 4).

In ordering fittings it should be stated for what gas they are required.

For particulars and prices of Cylinder fittings and accessories see pages 9 to 15.

No Credit for Gas Returned.—No credit can be given for gas returned in Cylinders, as the valves of all Cylinders arriving at the Works are immediately opened and the contents (if any) blown off.

Rent.—Rent is charged after the first fortnight as per particulars above on all Cylinders lent out by the Company. In case a Customer having incurred a rent charge on a Cylinder decides to purchase the Cylinder, the Company may remit a portion or all of the rent charge according to circumstances. Customers who are frequent users of Oxygen will find it an economy to purchase their own Cylinders.

Delivery of Private Cylinders.—It will greatly facilitate prompt return of Customers' own Cylinders if they will advise the Company by post when they are sending Cylinders to be filled quoting the Cylinder numbers. **A label bearing the Customer's name must be attached to each Cylinder, to identify it.**

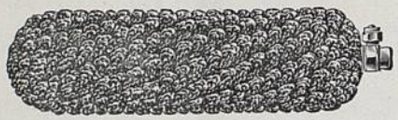
PRICES OF HEMP COVERS, WOODEN BOXES & COIR COVERS FOR TRANSPORT OF CYLINDERS BY RAIL.—*See page* 1.

Size of Cylinder ...	6 ft.	10 ft.	12 ft.	15 ft.	20 ft.
Hemp Cover	3/6	4/–	4/6	5/–	5/6
Wooden Box	1/6	1/6	1/6	2/–	2/6
Coir Cover	1/6	1/6	1/6	2/–	2/–

Size of Cylinder. ...	40 ft.	60 ft.	80 ft.	100 ft.
Hemp Cover	7/6	9/6	13/–	16/–
Wooden Box	3/–	—	—	—
Coir Cover	2/6	2/9	3/3	3/6

Private Owners of Cylinders are recommended to employ Hemp Covers, as they are neater and more durable than either Boxes or Coir Covers. (*See Fig. 1.*)

Fig. 1.



Notice *re* Covers.—With the object of preventing inconvenience and delay, the Company supply covers under the following conditions:—

1. Customers ordering gas by rail in the Company's Cylinders will be debited with the value of the cover, and afterwards credited in full if it is returned carriage paid and in sound condition.

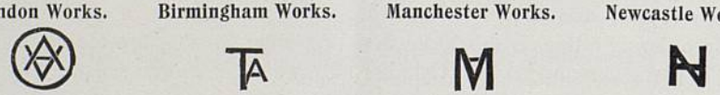
2. Customers sending in their own Cylinders to be filled, unprotected by any of the approved forms of covering, and with no instructions to cover, will have their Cylinders returned in new covers, with which they will be debited.

PROVING OF CYLINDERS.

Annealing. — In accordance with Government recommendations all Cylinders (before being subjected to the usual hydraulic test for the first time) must be annealed by the Company at one or other of its Works.

The annealing marks of the Company are as under:—

London Works. **Birmingham Works.** **Manchester Works.** **Newcastle Works.**



The charges for annealing including re-test are as under:—

Cylinders up to and including 40 feet capacity 2/–
Ditto over ditto 3/–

The above charges will only be incurred *at intervals of four years*, when annealing will be repeated, the ordinary annual hydraulic test being considered sufficient in the interval.

Testing.—All Cylinders received at the Company's Works to be filled for the first time will, after annealing, be tested hydraulically to a pressure of 1½ tons per square inch and afterwards registered. No extra charge, however, is incurred for this. The Company re-test all Cylinders annually, for which a charge of 1s. is made, a periodical re-test being necessary as much in the interest of the Customer as of the Company.

Stretch Apparatus.—All hydraulic testing of Cylinders is done by the Company in their Stretch indicating apparatus. This system was first introduced by the Company twenty-two years ago. It was officially approved by

the British Government's Cylinder Committee of 1896, and has recently been added to the official Cylinder Regulations of Germany and other countries. Being an apparatus of general interest it is illustrated and described on the following page.

Test Marks.—The hydraulic test marks of the Company are as follows:—

London Works. **Birmingham Works.** **Manchester Works.** **Newcastle Works.**

The Company's Works accept each others anneal marks but not each others test marks.

Numbering of Cylinders.—All the Company's Cylinders are numbered, and Customers' Cylinders coming in to one of their Works for the first time, unnumbered, to be filled, and with no instructions as to numbering will (after having been annealed and tested) be numbered and stamped by the Company in accordance with their own test books. This plan is adopted by the Company in order to retain a life record of each Cylinder passing through their hands.

Valves.—All the Company's Cylinders are fitted with valves to take standard connections (see Figs. 3 and 4.) Special care and experience have been brought to bear on the construction and design of these valves, and the Company guarantee the quality of material and workmanship to be of the best. All valves are separately tested to a pressure of 1½ tons per square inch before they are fitted on to Cylinders.

Valving of Cylinders.—A charge of 1s. is made for fixing a valve in a Cylinder. (Except when this charge is covered by annealing charge.)

Distinctive Colours of Cylinders, Regulators and Gauges.—Oxygen is charged into Cylinders painted **Black** and Coal-gas (or Hydrogen) into Cylinders painted **Red**. Under no circumstances will Oxygen be put into a Red Cylinder or Coal-gas (or Hydrogen) into a Black one. The above distinctive colours have been adopted by the trade, and any Customer who should violate the rule by sending to one of the Company's Works a Red Cylinder having contained Oxygen, or a Black Cylinder having contained Coal-gas (or Hydrogen), will be held responsible for the consequences. Regulators, Gauges, and other Fittings are also distinguished in the same manner, those intended for Oxygen being painted Black, and those intended for Coal-gas (or Hydrogen) being painted Red. It is a dangerous practice to use the same Regulator or Gauge for both Oxygen and Coal-gas (or Hydrogen). Gauges should be returned periodically for adjustment and re-testing by the makers.

Nitrogen Cylinders are painted grey and fitted with right-hand valves.

Caution *re* use of Oil or Grease.—Customers are specially cautioned against using oil or any fatty matter on their fittings.

Left-hand Fittings for Coal-gas (or Hydrogen) Cylinders.—As an additional and almost absolute protection from accident through the inadvertent mixture of gases, the Company, many years ago, introduced left-hand screwed connections in the case of all Coal-gas (or Hydrogen) fittings. All the Company's own stock is fitted in this way, and the practice has been almost universally adopted in the trade. *The Company refuse to fill any Cylinders with Coal-gas (or Hydrogen) except such as are fitted with left-hand screwed connections.* When Coal-gas or (Hydrogen) Cylinders *having Oxygen Connections* are delivered at the Company's Works, the Customer will be communicated with and asked to give his authority to have the Cylinders fitted with left-hand connections. *If he declines to do so his Cylinders will be returned empty.* Customers who are willing to have their Cylinders altered in the above manner *must also send all their other Coal-gas (or Hydrogen) fittings to be similarly altered*, or they will be useless when the Cylinder is returned.

STRETCH TESTING APPARATUS FOR CYLINDERS.

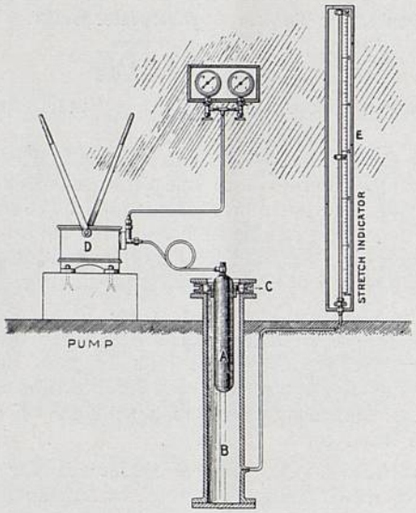


Fig. 2.

As supplied to the British and other Governments.

Prices on Application.

This apparatus consists of a cast-iron chamber B, in which the Cylinder A to be tested is suspended. D, an hydraulic pump employed for testing the Cylinder A. E, a gauge glass communicating with the bottom of chamber B; and C, an india-rubber joint ring, which is capable of closing and making a perfect joint round the shoulder of the Cylinder. The method of testing is as follows :—Both Cylinder A and chamber B are filled with water to the exclusion of all air, and a perfect joint is made round the neck of the Cylinder by inflating the india-rubber ring C, which can be instantaneously done by water pressure from the ordinary main supply. When the Cylinder is gradually subjected to the test pressure by means of the pump D, its expansion is measured by the displacement of water from the chamber B, and this displacement is indicated by the rise of the water level in the gauge glass, which continues until the maximum test pressure is obtained. The pressure is then released, and if no permanent stretch has been given to the metal, the water will return to its original level in the indicator. If, however, any permanent stretch has been caused this will not be the case, and the Cylinder would therefore be rejected as unfit for use.

The value of this apparatus is obvious. Its employment insures that a Cylinder is never strained beyond the "elastic limit" of its metal, and without this safeguard no hydraulic test is reliable.

HINTS TO USERS OF COMPRESSED GASES.

ORDERING GAS.

Order your Cylinders some days before they are required for use. State clearly the quantity and kind of gas or gases required.

State clearly what fittings, if any, are required.

PRIVATE CYLINDERS.

If you are a constant user of compressed gases you will find it cheaper and better to buy your own Cylinders and fittings, and send the former, when necessary, to your Agent, or to the Works of the Company in your district to be filled.

GAUGING CONTENTS OF CYLINDERS.

When Cylinders arrive from the Company's Works, gauge them, to see that they contain the full quantity of gas. Sometimes, in transit, valves are jarred, so as to start a slight leak of gas, which can generally be stopped by screwing down the valve spindle a little tighter.

For gauging Cylinders, use *separate* gauges for Oxygen and Coal-gas (or Hydrogen).

TESTING FOR LEAKAGE.

After gauging the Cylinder, or, if a Cylinder is not gauged, the moment it comes to hand, test the valve with *water*, by pouring a small quantity into the valve outlet. If *no bubbles show in the water* you can rest satisfied that all is gas-tight. Repeat this test *always* after using gas until the Cylinder is empty.

It is desirable also to test round the valve spindle *when the valve is open*, especially when coupled up to a regulator or fine adjustment valve, and if any leak is found, tighten down the gland nut round the valve spindle.

CYLINDER FITTINGS.

If you use your own fittings in connection with hired Cylinders, it is as well to try them on arrival of Cylinders to make sure that everything is accurate.

Never use fittings with taper screwed connections. They are unreliable, unmechanical and most injurious to valves.

Never use keys of long leverage to close Cylinder valves. They give undue power, which is injurious to valve seats. If a valve leaks after the spindle is screwed up with an ordinary key it is often due to grit on the seat. To remove this, open and close the valve sharply until the leak stops.

OIL CAUTION.

Avoid the use of oil or lubricant in any form, and keep all sockets and nipples and working parts dry and free from grit.

POSITION OF CYLINDERS.

If possible, always use the Cylinders in a vertical position. By so doing there is far less likelihood of moisture or grit that may be in a Cylinder getting blown into the valve or other passages. This is especially desirable in the case of Coal-gas.

RETURN OF EMPTY CYLINDERS.

Return hired Cylinders to the Company whenever they are done with and thus avoid paying rent on them. Also return all fittings which have been lent with the Cylinders, otherwise they will be charged for. A label bearing the Customer's name must always be attached to a Cylinder when it is returned to the Company's Works for purposes of identification.

RETURNED GAS.

The Company allow no credit for returned gas, as, in accordance with their regulations, Cylinders which have been used are always emptied before being re-filled. It is therefore well to note that gas returned is gas wasted. Oxygen never deteriorates by being kept in Cylinders.

STORING COAL-GAS IN CYLINDERS.

Avoid storing Coal-gas in Cylinders for any great length of time, as this gas gradually deteriorates. If gas has to be stored in a Cylinder for any length of time, it is better to use Hydrogen. Hydrogen never blackens limes.

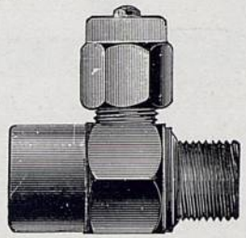
CLEANING COAL-GAS CYLINDERS.

Always save a little pressure in your Cylinder, and then either take it into the open air and blow it off with *valve downwards*, or return it to the Company to be treated in this way. By this means all residue will be driven out.

ILLUSTRATED PRICE LIST OF CYLINDER FITTINGS AND ACCESSORIES.

NOTE.—Valve Sockets and the Nipples of Fittings should be cleaned and freed from grit before being connected. The use of oil or grease of any kind for lubricating Valves, Gauges or other Fittings used with compressed Oxygen must be strictly avoided.

Fig. 3.—CYLINDER VALVE.
(No. 1 Type.)



8s. 6d. each.

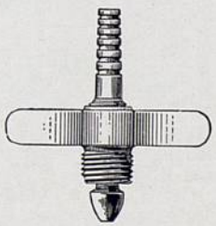
This is the Company's Standard type of Valve in the London, Birmingham and Newcastle districts, and it is fitted to all Cylinders in those districts, unless otherwise instructed.

Fig. 4.—CYLINDER VALVE.
(No. 2 Type.)

8s. 6d. each.

This Valve has a side connection, otherwise it is the same as No. 1 Type. It is chiefly employed on Cylinders in the Manchester district. It takes the same fittings as the No. 1 Type.

Fig. 5.—NIPPLE AND UNION FOR CYLINDER VALVES.



2s. 3d. each.

This connection is sent out with hired Cylinders unless a Fine Adjustment Valve or Regulator is ordered. To connect with Cylinder Valve screw the Union into Valve Socket several turns. Then screw down the Nipple in the Union until it presses on the seat of Valve Socket. Then tighten up the Union by hand. The external and internal screws of the Union being of different pitch, the power in making the joint with Valve is thereby greatly increased. This is the type of joint invariably used on all valve fittings subsequently illustrated. Some Nipples and Unions are, however, made to screw up direct, as power is not a matter of importance in making such simple connections.

All kinds of Cylinder Valves and Special Fittings made to order.

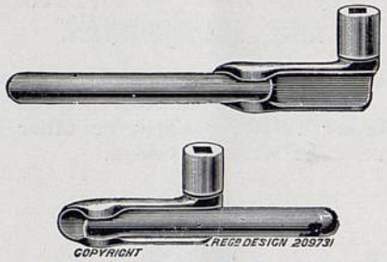


Fig. 6.—FOLDING LEVER KEY. (Steel throughout).

1s. **6**d. each, Black. **2**s. **3**d. each, Nickel-plated.

This key is principally sent out with hired Cylinders. When the lever is extended an increased power is obtained for opening the Valve. When closed an ordinary T handle is formed, thus giving reduced leverage for closing the Valve, thereby preventing injury to the Valve seating. The construction also prevents the Valve spindle being turned the wrong way in opening or closing the Valve.

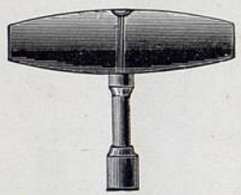


Fig. 7.—VALVE KEY.

Wooden Handle (as shown) ... **2**s. each.
All Steel (Black) ... ... **1**s. **6**d. each.

Fig. 8.—GLAND NUT SPANNER.

1s. each.

This Spanner is useful for tightening up the Gland Nut of Cylinder Valves when a leakage of gas is observable round the Valve Spindle. Cylinder owners should possess one, but it is not supplied with hired Cylinders.

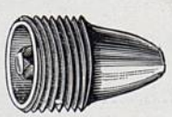


Fig. 9.—PLUG FOR CYLINDER VALVE SOCKET.

1s. each.

This Plug is useful to prevent injury to Valve Socket. It can be screwed in and out of the Valve Socket by means of the ordinary Valve Key. It is not supplied with hired Cylinders.

All kinds of Special Fittings made to order.

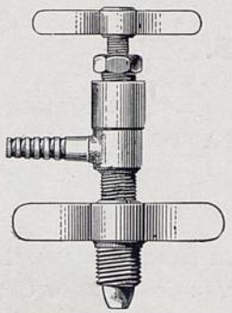


Fig. 10.—FINE ADJUSTMENT VALVE.

(Large Pattern).

7s. each.

Can be obtained on hire at the cost of **6**d. per week.

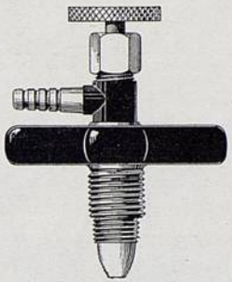


Fig. 11.—FINE ADJUSTMENT VALVE.

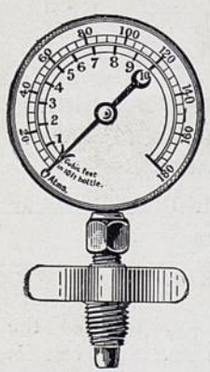
(Small Pattern).

6s. each.

These Valves are not Automatic Pressure Regulators, and consequently must not be used for Double Lantern work. They can only be employed as substitutes for the Nipple and Union connection, but for this purpose they are useful. They give a more delicate means of adjusting the flow of Gas from the Cylinder than the ordinary Cylinder Valve. After they are connected to the Cylinder Valve the latter may be left open and all subsequent regulation can be effected by the fine adjustment valve. Care must, however, be taken to see that no leakage of gas occurs either in the Socket or round the Spindle of the Cylinder Valve.

The Cylinder Valve should be closed as an additional precaution against leakage when the Cylinder is not in use.

Fig. 12.—GAS PRESSURE GAUGE.



4 ins. diameter, **30**s. each.

3 ins. diameter, **25**s. each.

These Pressure Gauges are useful to frequent users of Oxygen Cylinders, and particularly to Agents, as a means of ascertaining the quantity of gas in Cylinders. They are connected to Cylinders in the same way as the Nipple and Union, Fig. 5.

The Gauges, as illustrated, are specially marked in atmospheres and feet, and the cubic contents of any Cylinder may be readily calculated in the following manner:—

The figures on outer ring indicate pressure in atmospheres; 120 atmos. being the pressure to which all Cylinders are charged.

The figures on inner ring indicate the number of cubic feet of gas contained in a 10 ft. cylinder. To calculate the quantity of gas contained in any Cylinder, multiply the figure to which the needle points by the multiple of 10, thus, if the gauge is attached to a 40 ft. Cylinder, and the needle points to 6, then 6 × 4 = 24 ft. = quantity of gas in Cylinder.

Both types of Pressure Gauge are fitted with safety checks in the stem to prevent a sudden rush of gas into the gauge tube when the Cylinder Valve is opened.

Fig. 13.—LEAK TESTER.

Nickel-plated.

2s. **6**d. each.

To Use the Tester. Press the conical rubber end into the outlet of the Cylinder Valve. If there is the slightest leakage of gas it will be at once indicated by bubbles passing through the water. If, on the other hand, there is no leakage, bubbles will not be perceptible.

The instrument is a handy substitute for the clumsy method of testing for leakage by pouring some water into the socket of the Valve. It is only about 4 inches long, and can be carried in the waistcoat pocket. The water is found to evaporate very slowly, and will only require renewal at long intervals of time.

N.B.—Oil must not be used in the Tester.

The Company not being makers of Pressure Gauges do not guarantee these articles in any respect. They are only supplied subject to the purchaser accepting all risk (if any) in respect of them.

REGULATORS.

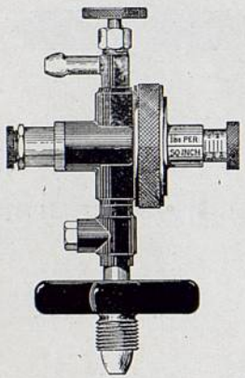


Fig. 14.—"ENDURANCE" AUTOMATIC REGULATOR.
(Patent.)

30s. each.

FITTED WITH HIGH PRESSURE GAUGE TO REGISTER THE CONTENTS OF CYLINDER,

15s. extra.

This Regulator is suitable for every class of work for which Oxygen is employed (except metal cutting—see Fig. 15 below). It automatically delivers gas from the Cylinder at any pressure to which it is set up to 30 lbs. per square inch. It is of substantial construction, and has been specially designed by the Company for workshop use. It is manufactured by the Company, and is specially recommended for all kinds of blowpipe work, and for injector lantern jets. The adjustable screwed socket on the side of the Regulator is graduated in lbs. per square inch, and the Regulator can be set by this means to any desired constant pressure, thus enabling the usual low pressure gauge to be dispensed with.

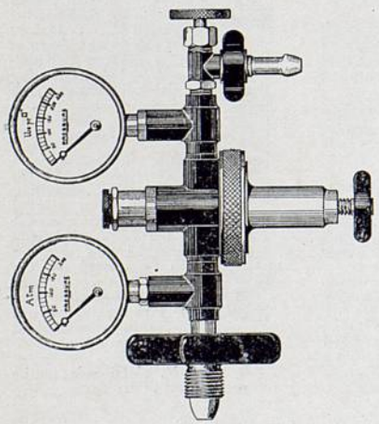


Fig. 15.—"ENDURANCE" HIGH PRESSURE AUTOMATIC REGULATOR.
(Patent.)

FITTED WITH HIGH AND LOW PRESSURE GAUGES,

63s. each.

This Regulator is similar to the one illustrated in Fig. 14, but is adjusted to pressure gauge by means of thumb screw to automatically deliver gas at any desired pressure up to 10 atmospheres. It is specially constructed for use in metal cutting where comparatively high constant pressures are required.

All kinds of Special Fittings made to order.

REGULATORS—*continued.*

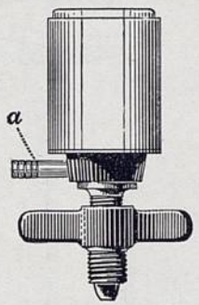


Fig. 16.—BEARD'S AUTOMATIC REGULATOR.

21s. each.

Can be obtained on hire at the cost of **1**s. per week.

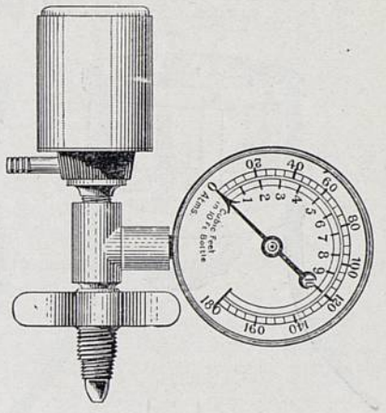


Fig. 17.—TEE PIECE (as shewn) TO COMBINE REGULATOR AND GAUGE.

6s. each.

Y PIECE for same purpose.

6s. each.

This regulator is extensively used in Lantern work. It reduces and automatically controls the pressure and flow of gas from the Cylinders, so that after the Cylinder Valve is opened the gas may be regulated by the taps on the Lime-light jet; *a* is the delivery nozzle to which the rubber tubing to jet should be connected.

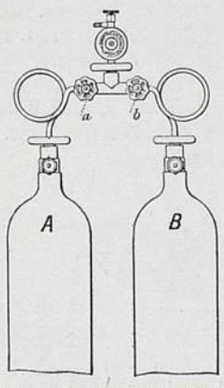


Fig. 18.—CONNECTOR BETWEEN REGULATOR AND TWO CYLINDERS.

Price, without Regulator, **30**s.

In Blow-pipe work the only object of a combined Regulator and high-pressure Gauge, as shewn in Figs. 14 and 17, is to guard against the Oxygen supply running short in the middle of a job. Pressure Gauges permanently attached to Regulators are a fruitful source of trouble. They soon become inaccurate (particularly the small type so frequently employed) and being delicate in construction they are liable to injury in workshop handling. The Connector here illustrated is an excellent substitute for the pressure Gauge permanently attached to a Regulator. The Regulator is in communication with two Cylinders A and B, one of which can be shut off when the other is in use. Thus, if the valve of Cylinder A and the pipe valve *a* are open whilst the valve of Cylinder B and the pipe valve *b* are closed, Oxygen flows from Cylinder A through the Regulator until it begins to empty. The valves of Cylinder A are then closed and those of Cylinder B opened. Oxygen will then flow from Cylinder B whilst the empty A Cylinder can be removed and replaced by a full one. Thus, it will be readily seen that a continuous supply of Oxygen can be maintained to the Blow-pipes by the employment of this connector, and for permanent work Regulators with this connector will be found more convenient and reliable than those fitted with pressure Gauges. A separate pressure Gauge (Fig 12)—preferably of the larger diameter—should be in the possession of all constant users of Cylinders to enable them to check the contents of Cylinders when they arrive from the compressing factory.

All kinds of Special Fittings made to order.

CYLINDER STANDS.

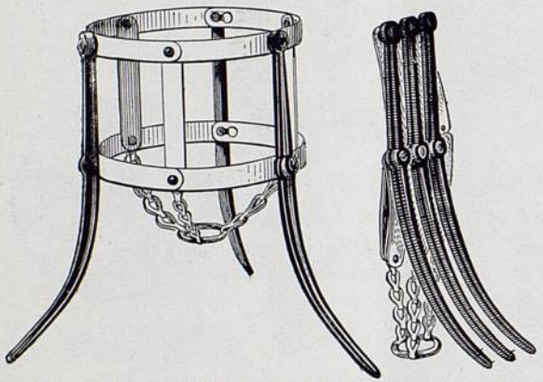


Fig. 19.—PORTABLE CYLINDER STAND.

Suitable only for 20 ft. Cylinders and under.

5s. and **6**s. each.

In ordering, please state the capacity of Cylinder, and if fitted with Hemp Cover.

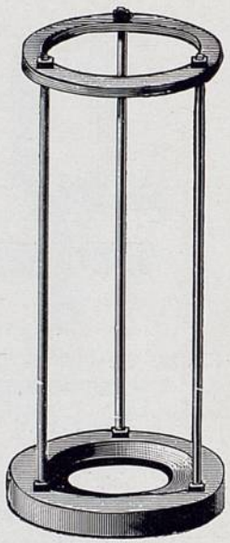


Fig. 20.

CYLINDER STAND.

Suitable for 40 ft. Cylinders and upwards.

6 ins. dia., **9**s. each.

8 ins. dia., **10**s. **6**d. each.

In ordering, please state the capacity of Cylinder, and if fitted with Hemp Cover.

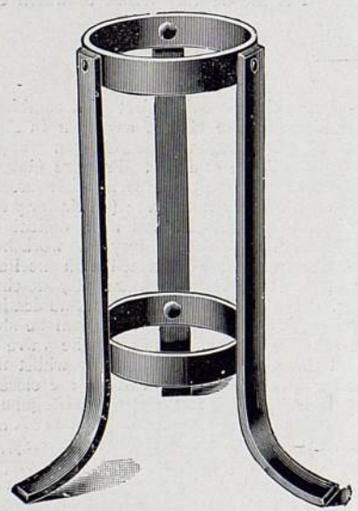


Fig. 21.—CYLINDER STAND.

Suitable for 20 ft. Cylinders and upwards.

4 ins. to 6 ins. dia., **6**s. each.

8 ins. dia., **7**s. **6**d. each.

In ordering, please state the capacity of Cylinder, and if fitted with Hemp Cover.

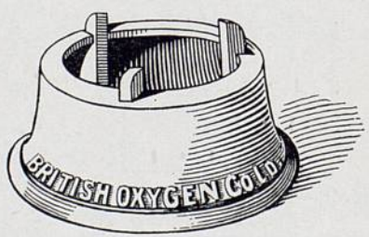


Fig. 22.—CYLINDER STAND.

Suitable for 40 ft. Cylinders and upwards *but only without covers.*

$5\frac{1}{2}$ ins. dia., **9**s. each.

7 ins. dia., **10**s. **6**d. each.

All kinds of Special Fittings made to order.

CYLINDER STANDS—*continued.*

Fig. 23.—SELF-ADJUSTING CYLINDER STAND.

SUPPLIED IN TWO SIZES.

To take Cylinders up to $5\frac{1}{2}$ inches diameter.

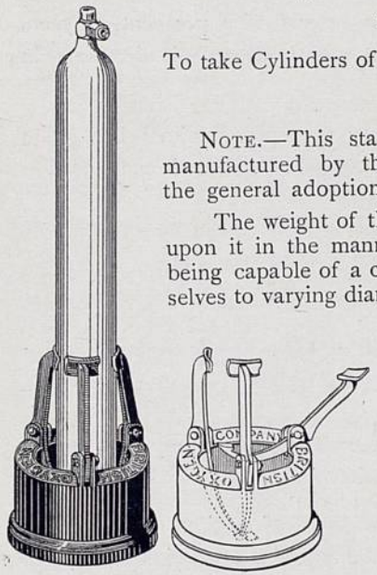
10s. each.

To take Cylinders of $5\frac{1}{2}$ inches diameter and upwards, with covers.

12s. **6**d. each.

NOTE.—This stand is of a new registered design. It is manufactured by the Company and meets a want created by the general adoption of hemp covers.

The weight of the Cylinder is employed to close the jaws upon it in the manner indicated by the sketches, and the jaws, being capable of a considerable range of movement, adapt themselves to varying diameters of Cylinders.



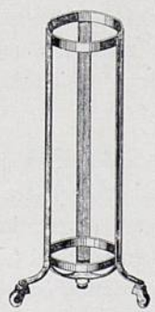


Fig. 24.—CYLINDER STAND ON ROLLERS.

Suitable for Hospitals, &c.

To take 4 inch diameter Cylinder without cover.

Price ... ... **17**s. **6**d.

To take 4 inch diameter Cylinder in cover or $5\frac{1}{2}$ inch diameter Cylinder without cover.

Price ... ... **25**s.

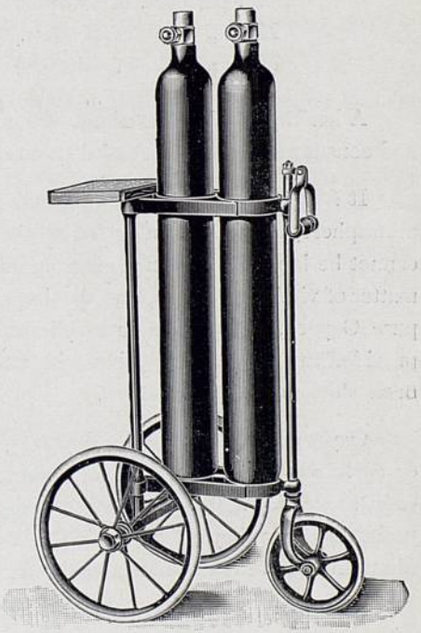


Fig. 25.—TROLLY STAND FOR PAIR OF CYLINDERS.

Suitable for Hospitals, &c.

To take 4 inch diameter Cylinders without covers.

Price ... .. **50**s.

To take 4 inch diameter Cylinders in covers or $5\frac{1}{2}$ inch diameter Cylinders without covers.

Price .. ... **70**s.

All kinds of Special Fittings made to order.

MEDICAL.

NOTES ON THE MEDICAL USES OF OXYGEN.

Air contains about 79·1 per cent. Nitrogen and 20·9 per cent. Oxygen. [Carbonic Acid (·04 per cent.) and other minor constituents of air discovered in recent years, are here disregarded.]

Oxygen is the portion of the air necessary to support animal life. The average respiration of a healthy adult man in a temperate climate is as follows:—

30 cubic inches per inhalation.
480 „ „ „ minute.

EXHALED AIR CONTAINS:—

4·4 per cent. of Carbonic Acid.
16·5 „ „ of Oxygen.
79·1 „ „ of Nitrogen.

A healthy man inhales about 400 cubic feet of air per twenty-four hours, and consumes about 20 feet of Oxygen during that time.

It frequently happens that through the presence of noxious gases in the atmosphere, or through enfeebled respiration, the requisite proportion of Oxygen cannot be inhaled. In such cases an additional supply of this gas becomes a matter of vital importance, and the introduction by the Company of chemically pure Oxygen, compressed into cylinders so as to be readily transported, has provided the medical profession with a therapeutic agent of which they have not been slow to avail themselves.

Oxygen is of the utmost value for purposes of resuscitation after suffocation or asphyxia. In mines, chemical works, gas works, and other places where such cases are of frequent occurrence, cylinders of Oxygen are placed in accessible positions where they are available for immediate use when required (*see* page 21). Many lives have thus been saved by the prompt administration of the gas.

Oxygen inhalation is, however, not restricted to extreme cases of this description. Its value in cases where respiration is impaired through illness is now fully recognised by the medical profession, by whom it is largely prescribed.

Oxygen is also extensively prescribed for the treatment of wounds and sores and for many maladies not connected with the respiratory organs.

For General Hints to Cylinder Users, see pages 7 and 8.

SPECIAL REGULATIONS FOR SUPPLY OF OXYGEN FOR MEDICAL PURPOSES.

For prices and particulars of Oxygen and Cylinders, see Pages 2 and 3.

Oxygen is so generally recognised as valuable for medical purposes and for resuscitation in cases of "gassing," drowning, etc., that with a view to meeting the convenience of the medical profession, the Company have made arrangements to supply Oxygen for *Medical Purposes at their Works in London, Birmingham, Manchester and Newcastle, at any hour of the day or night.*

Orders should distinctly state that the Oxygen is wanted for medical purposes, and the Company beg to draw attention to the following regulations which they have made with a view to conducting this branch of their business with extra dispatch :—

1.—When medical orders are received for Oxygen, unaccompanied by an order for inhaling apparatus, the Company will send with the Cylinder one gun-metal nipple and union (Fig. 5) to fit Cylinder valve, one valve key (Fig. 6), and a short length of indiarubber tubing (Fig. 26) with glass or ebonite mouthpiece, by means of which the gas can be inhaled direct from the Cylinder. The price of the indiarubber tubing and mouthpiece (which are not returnable) is **2/-** with glass mouthpiece, **2/6** with ebonite mouthpiece.

2.—When an inhaler is ordered, but type not specified, No. 1 or 2 type (Figs. 28 or 29) will be sent.

3.—Credit will be allowed in full for Cylinder, nipple, union and key, if returned in good condition within a fortnight, *but no credit can be given for inhalers or for indiarubber tubes and mouthpieces*, as the Company do not consider it right to send out a second time articles which may have been in close contact with cases of illness and disease.

4.—Unless otherwise instructed, Oxygen ordered for medical purposes by letter will be delivered in the usual way by road carrier (*see* page 1).

5.—In cases where Oxygen for inhalation is ordered by telegram, without special instructions as to delivery, it will be forwarded by special messenger direct, or by special messenger to catch first passenger train if wanted in the country.

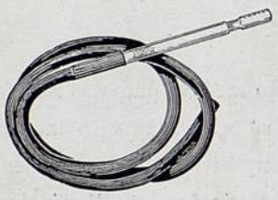
6.—As there are no ordinary means of delivery open to the Company from 1 p.m. on Saturday to 8.30 a.m. on Monday, and between 6 p.m. and 6 a.m. on all other days of the week and on public holidays, a supply of Oxygen can only be *ensured* at these times by sending for it to the Company's Works. An effort will be made to execute urgent orders received by telegram from medical men during these periods by employing cabs or special messengers *but no delivery can be guaranteed.*

7.—All extra expenses of special delivery will be charged to the Customer.

OXYGEN INHALING APPLIANCES.

N.B.—No Inhaler under any circumstances can be sent out on hire.

Fig. 26.—INHALING TUBE.

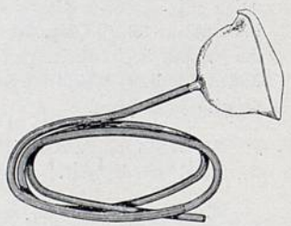


Glass Mouthpiece, with 3 feet of tubing ... ... **2**s. **0**d. each.
Ebonite do. ... **2**s. **6**d. „

This is the simplest form of Inhaling Apparatus, and is sent out with all Cylinders of Oxygen ordered for medical purposes. (See previous page.)

To Use.—Connect the indiarubber end of tube to grooved end of nipple and union Fig. 5). Open the Cylinder Valve gently by means of the lever key (Fig. 6), tapping it with the wrist, and when the desired amount of Oxygen is flowing from the Cylinder, allow the patient to inhale through the mouthpiece. If a fine adjustment valve (Figs. 10 and 11) or a regulator (Figs. 14 or 16) is used on the Cylinder instead of the nipple and union, connect the tube to outlet of same and regulate as per instructions under each illustration. After inhalation make sure that the Cylinder Valve is closed. (See page 7.)

Fig. 27.—GLASS FACE-PIECE.



Covering Mouth and Nose, fitted with india-rubber tube, etc. ... ... **5**s. each.

This face-piece is sometimes preferred to the mouthpiece (Fig. 26), but it is only supplied to order.

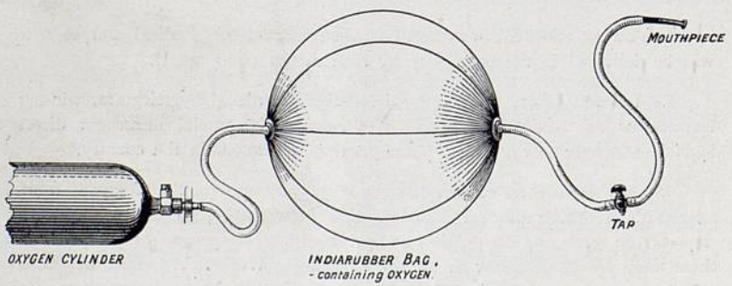


Fig. 28.—INHALER (No. 1 Type).
Price **7**s. **6**d.

Oxygen Inhaling Appliances—*continued.*

N.B.—No Inhaler under any circumstances can be sent out on hire.

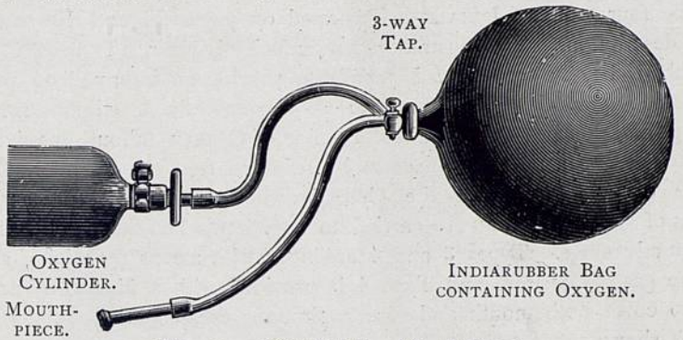


Fig. 29.—INHALER. (No. 2 Type.)
Price ... ... **13**s. **0**d.

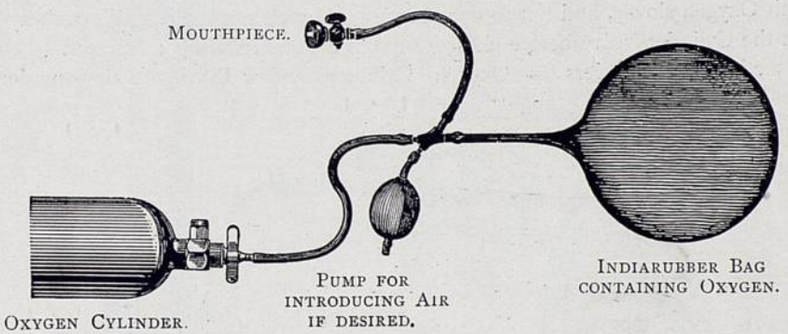


Fig. 30.—INHALER (No. 3 Type).
Price ... ... **26**s. **0**d.

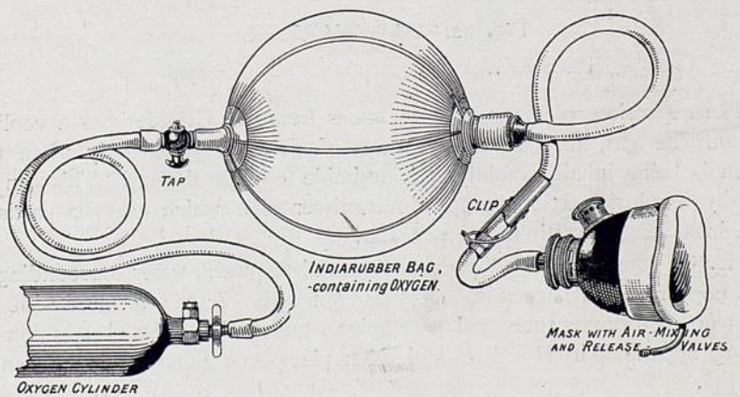


Fig. 31.—INHALER. (No. 4 Type.)
Price ... ... **37**s. **6**d.

OXYGEN INHALING APPLIANCES—*continued.*

N.B.—No Inhaler under any circumstances can be sent out on hire.

The four types of INHALERS illustrated on pages 18 and 19 require no special description, as the illustrations are sufficiently clear. The object of the india-rubber bag in each case is merely to provide an intermediate vessel in which small quantities of Oxygen can be conveniently stored and measured. The bag in each case will store about 1 gallon of Oxygen (about one-sixth of a cubic foot) at a time. Type 1 cannot be removed from the Cylinder. Type 2 can be disconnected from the Cylinder when the bag is full, and small supplies of Oxygen can thus be carried to a patient's bed-side. This is sometimes an advantage. Types 3 and 4 are fitted with means for mixing air with the pure gas if desired, and Type 4 is provided with a Mask or Face-piece so as to cover both mouth and nose, expirations escaping through the release valve as shown.

N.B.—In all cases when filling the Inhaler bags care must be taken to admit Oxygen slowly, and not to overcharge them with gas. After filling always shut the Cylinder Valve before closing any tap on the Inhaling apparatus. For connecting the Inhalers to Oxygen Cylinders follow the instructions under Fig. 26, page 18.

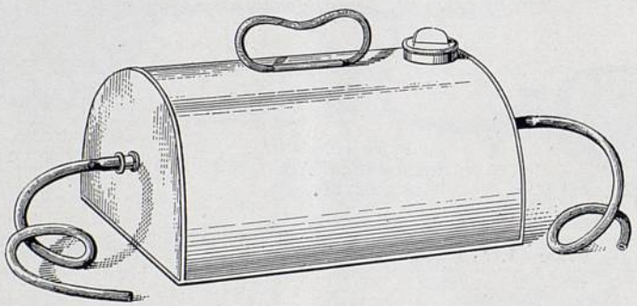


Fig. 32.—GAS WARMER.

Price ... ... **35**s.

The expansion of Oxygen as it issues from the Cylinder has a cooling effect on the gas, and in certain cases of sickness, particularly when the Oxygen is being inhaled rapidly, it is desirable to warm the gas. This can be done by employing a long supply india-rubber tube which can be partially coiled in a vessel containing warm water.

Fig. 32 consists of a copper vessel containing warm water surrounding a coiled copper tube, designed to effect this purpose. It can be used with an Inhaler or an ordinary tube and mouthpiece, and it is a useful addition to Inhaling apparatus in Hospitals and other places where Oxygen is constantly employed.

For Movable Cylinder Stands, specially suitable for Hospital use, see Fig. 25, page 15.

LIFE-SAVING OXYGEN APPLIANCES.

A memorandum signed by the Chief Inspector of Factories, and issued from the Home Office in May, 1906, recommends that "a Cylinder of compressed Oxygen fitted with a piece of rubber gas-tubing and a mouth-piece should be kept in constant readiness" where cases of carbonic oxide poisoning or "gassing" are liable to occur.

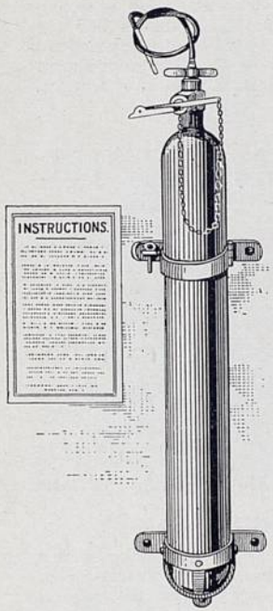


Fig. 33.—Cylinder in Wall Bracket.

Price complete, as shown, with Card of Instructions.

£2. 15s.

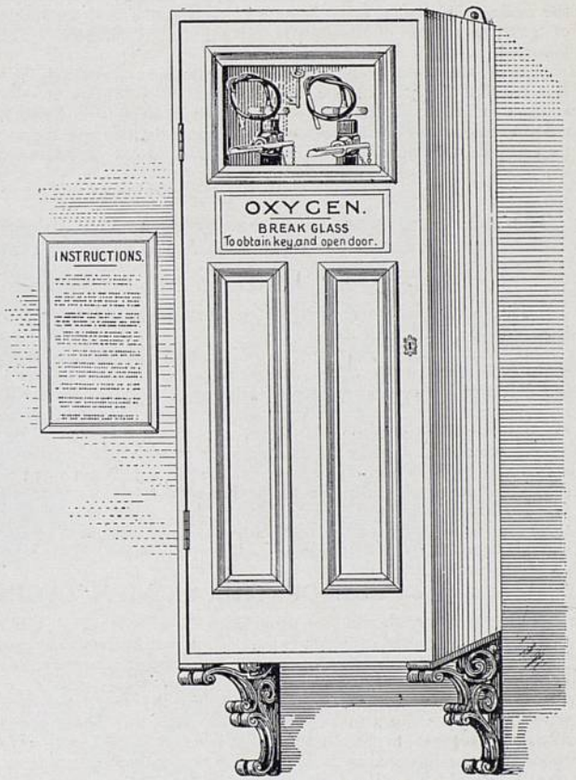


Fig. 34.—Cylinder Wall-Box.

Price complete, as shown, with Card of Instructions,

£5. 10s.

Figs. 33 and 34 illustrate convenient methods of placing Oxygen Cylinders in Factories, Collieries, Chemical Works, Cement Works, Gas Works, and all places where cases of "gassing" are liable to occur amongst the workmen. In such cases it is of vital importance to have the position of Cylinders known and accessible to all. It is also of importance to have the methods of administering the gas as simple as possible. In Fig. 33 the equipment consists of a Cylinder containing 20 feet of Oxygen (the size generally recommended), a lever key (Fig. 6) fixed in position to open the valve, and attached to the Cylinder by chain, a nipple and union (Fig. 5) fixed in position with a tube and mouthpiece (Fig. 26) attached. The Cylinder has only to be removed from the wall bracket when required for use. In Fig. 34—which is specially recommended—there are two cylinders each containing 20 feet of Oxygen, and each equipped in the manner described above. These Cylinders are enclosed in a wooden wall-box, and the method of obtaining a Cylinder for use is clearly indicated by the printed instructions on the door. A duplicate or master key is provided with each box or set of boxes for the use of the Works Manager. The advantage of two Cylinders is obvious. The wall-box should never by any mischance be empty, for duplicating the equipment enables one Cylinder to be sent away for filling whilst the other remains available for use. *The above prices do not include Oxygen, which is charged for separately at usual rates.*

LIFE-SAVING OXYGEN APPLIANCES—*continued.*

A fine adjustment valve (Fig. 10) can be employed on the Cylinders if desired, and it is frequently recommended. The Company do not, however, advocate its use for this particular purpose. It involves the manipulation of two valves if the directions under Fig. 10 are followed, and it increases the liability to leakage when the Cylinder is out of use if they are not followed. When Oxygen has to be administered on the spur of the moment it is most desirable to avoid any vestige of complication about the Cylinder, and the ordinary Cylinder valve is so well constructed that no difficulty in controlling the flow of gas by means of this valve should be experienced if the instructions are properly followed.

Most large works possess their Ambulance Corps and Fire Brigades, and it is recommended that these should be regularly instructed in the use of Oxygen Cylinders and the administration of the gas. No ordinary workmen should, however, be debarred from using the gas in emergencies, and printed instructions (which are supplied by the Company) should be conspicuously displayed beside every wall-bracket or box containing Cylinders of Oxygen.

The following instructions are given by the Chief Inspector of Factories in the Memorandum of May, 1906, referred to above:

DANGER OF GASSING.

The first symptoms produced by breathing the gas are giddiness, weakness in the legs, and palpitation of the heart.

If a man feels these symptoms he should at once move into fresh warm air, when in slight cases they will quickly disappear.

Exposure to cold should be avoided as it aggravates the symptoms.

A man should not walk home too soon after recovery, as muscular exertion after exposure to the gas is to be avoided.

If a man should be found insensible or seriously ill from the gas he should at once be removed into fresh warm air, and immediate information be sent to the oxygen administrator, a medical man being sent for at the same time.

No man should work alone on any work which would be likely to involve exposure to the gas. Should the nature of the work cause the man to enter a culvert or hole, he should have a rope tied securely round his waist, held at the other end by his mate standing outside.

USE OF THE OXYGEN CYLINDER.

The cylinder should be provided with a lever key, nipple and union, together with a rubber tube at the end of which is a mouthpiece. It is also advisable to have a small pressure gauge attached to the cylinder so that loss of oxygen may be observed and the cylinder kept in working order.*

Open the valve gradually by tapping the lever key (fully extended) with the wrist until the oxygen flows in a gentle stream from the mouthpiece in the patient's mouth, and allow the oxygen to be breathed until relief is obtained. The lips should not be closed round the mouthpiece, as it is important to allow free egress for surplus oxygen. The nostrils should be closed during inspiration or inflation of the lungs, and opened during expiration or deflation of the lungs, so that the oxygen may be inhaled as pure as possible through the mouth.

If the teeth are set, close the lips and one nostril. Let the conical end of the mouthpiece slightly enter the other nostril during inspiration and remove it for expiration.

ARTIFICIAL RESPIRATION.

Artificial respiration is sometimes necessary in addition to the oxygen inhalation if the oxygen does not appear to act quickly.

Place the patient on his back, slightly raising the shoulders with a folded coat; remove everything tight about the chest and neck; draw the tongue forward and maintain it in that position. Grasp the arms just above the elbows, and draw them steadily above the head, keeping them on the stretch for two seconds and then folding them and pressing them against the chest for the same length of time. Repeat these movements about 15 times a minute for at least half an hour, or until natural breathing has been initiated, when the oxygen inhalation alone will suffice.

After recovery oxygen inhalation at intervals should be continued as desired.

*A separate pressure gauge in the possession of the Works Manager, or other authorised person responsible for the Cylinders being adequately charged with Oxygen, is probably preferable. Cylinders after use should always be handed to this person whose duty it should be to gauge the Cylinders and decide whether they should be refilled with Oxygen or restored to their receptacle.—B.O. Co., Ld.

LIFE-SAVING OXYGEN APPLIANCES—*continued.*

OXYGEN RESPIRATING APPARATUS FOR WORKING IN NOXIOUS OR IRRESPIRABLE GASES.

(Messrs. SIEBE, GORMAN & FLEUSS' PATENT.)

Price Complete, as shown, £22. 15s. 0d.

Fig. 35.—Front View.

Fig. 36.—Back View.

In places where Oxygen Cylinders are required for purposes of resuscitation, an apparatus which supplies a man with factitious but perfectly respirable air, entirely independent of any communication with the outer atmosphere, is almost essential. It is one thing to resuscitate a victim to noxious gases by means of Oxygen, but it is quite another thing to rescue him for the purpose of doing so. No more frequent instances of humble heroism are recorded than those where workmen have lost their own lives by entering one of these death traps with the object of rescuing a comrade. The British Government recommend the use of Oxygen Respirators to enable workmen to penetrate noxious atmospheres, and some foreign Governments go so far as to prescribe their use in Collieries in the proportion of one for every twenty miners.

One or more Oxygen Respirators, **in addition to Oxygen Cylinders,** should always be available for use amongst workmen employed in Collieries, Chemical Works, Cement Works, Gas Works, and all places where cases of "gassing" are liable to occur. They should also be within easy access of men at work in drains, sewers, culverts, flues and wells. Every Fire Brigade and Salvage Corps should also be equipped with both Oxygen Respirators and Cylinders of Oxygen. Nowhere is suffocation of more frequent occurrence than at fires, and the value of the one apparatus as a means of rescue, and the other as a means of resuscitation after rescue, cannot be exaggerated.

N.B.—Only experienced men thoroughly conversant with the working of the Apparatus, and trained in its use, should be permitted to wear the Oxygen Respirator and enter dangerous places.

LIFE-SAVING OXYGEN APPLIANCES—*continued.*

The following particulars of the Oxygen Respirating Apparatus (Figs. 35 and 36) are furnished by the Makers :—

DESCRIPTION.

This patented apparatus is designed to supply the user with a factitious but perfectly respirable air entirely independent of any communication with the outer atmosphere for about two hours at a time. It has no air pipe or other connections with the base of operations, so that for exploring and rescue work in mines, etc., its scope of usefulness is practically unlimited, the wearer being perfectly safe in the most deadly gases and able to walk any distance and to explore the most intricate turnings of a mine with every freedom of action. The principle of the apparatus is that the wearer breathes the same air over and over again, the carbonic acid being absorbed from it after each expiration, and at the same time the requisite amount of oxygen restored to it, thus rendering it pure and fit to be again inhaled into the lungs.

It is entirely of British design and British Manufacture.

Its simplicity is remarkable. There is a complete absence of complications. It has fewer connections and consequently fewer joints to keep tight than any other apparatus manufactured.

The importance of these points, in view of the fact that apparatus of this class is mainly used by unskilled men, cannot be overrated.

Less training is needed with this apparatus than with others. Five minutes suffice in which to become conversant with the whole apparatus and its working, and a very little practice makes the wearer quite proficient in its use. A man can put the apparatus on himself without assistance and be ready for work in one minute from the order to "get ready." It is the most comfortable and most flexible apparatus on the market, and is the lightest of the type using compressed oxygen. The apparatus is fitted with an emergency valve which enables the wearer at any moment to supply additional Oxygen to the breathing bag direct from the cylinders, and the pressure gauge is fixed in front so that the wearer can at all times see the quantity of Oxygen available for use. The apparatus is arranged to automatically pass a constant supply of two litres of Oxygen per minute into the breathing bag, this quantity being the maximum required under all conditions of hard work. This is the method of supply approved and recommended by the Royal Commission on Mines (1907).

The mouth-piece allows the wearer free movement of his head, being connected to the breathing bag by strong flexible corrugated tubes. The inhaling and exhaling valves in the latest pattern are of mica, and being of the simplest design, do not stick or get out of order. The mouth-piece is attached by a small rubber band, which fits comfortably round the outside of the mouth, and buckles behind the head. The nose-clip is made comfortably to fit every nose and cannot slip off. Mica goggles are supplied to protect the eyes. In place of mouth-piece and nose-clip, a half-mask, covering nose and mouth, can be worn if preferred. A mask is also made which completely covers nose, mouth and eyes.

Heavy work can be done with less fatigue with this apparatus than with any other system in use, CO_2 in the breathing bag at the end of the period of exertion being present in an almost negligible quantity, the percentage of O being very high.

Caustic Soda is the absorbent used and can be obtained in any town. In the bag system employed the soda is so placed that the movement of the wearer when walking or at work automatically rubs off the carbonated surface of the soda, and thus constantly exposes a fresh surface for the absorption of carbonic acid. The bag is very easily emptied after use and a fresh supply of soda can be placed in it immediately, and the apparatus made ready for use again in two or three minutes.

NOTE.—The Company recommend the above apparatus as combining efficiency with comparative lightness and simplicity. There are, however, other types on the market and they will be pleased to furnish particulars of these on application.

LANTERN.

For prices and particulars of Oxygen, Coal-gas, Hydrogen and Cylinders, see pages 2 and 3.

USEFUL NOTES FOR LANTERNISTS.

The quantities of Oxygen and Coal-gas used with various forms of limelight jets working to their full efficiency and the candle powers produced are approximately as follows :—

Blow-through jet { 5 ft. of Oxygen per hour. / 6 ft. of Coal-gas per hour.
Candle power 400—600.

This type of jet is now seldom used. It has been largely superseded by the injector-jet. Both types have the advantage of requiring only the Oxygen supply from a cylinder, Coal-gas being drawn from the ordinary house supply.

Injector-jet or ordinary mixed jet of medium power { 6 ft. of Oxygen per hour. / 7 ft. of Coal-gas per hour.
Candle power 1,000—1,200.

The injector-jet is a mixed jet which as stated above can draw its Coal-gas from the ordinary house supply. For efficient working, however, the Oxygen must be delivered to the jet at a pressure of from 12 to 15 lbs. per square inch. *It is necessary, therefore, to employ a regulator on the Oxygen Cylinder set to deliver gas at this pressure, which is considerably higher than that required for ordinary blow-through or mixed jets.* Stronger india-rubber tubing must consequently be used between the regulator and this jet. Ordinary india-rubber tubing is sufficient for connecting the jet with Coal-gas supply.

Ordinary mixed jets without injector require both Oxygen and Coal-gas to be delivered from cylinders through regulators, as it is necessary for both gases to be supplied to the jets under equal pressure.

Injector-jet or ordinary mixed jet of high power { 10 ft. of Oxygen per hour. / 12 ft. of Coal-gas per hour.
Candle power 1,600—2,000.

If Hydrogen is used instead of Coal-gas twice the quantity of Hydrogen is required, but the light obtained is slightly better.

REQUIREMENTS FOR A LANTERN ENTERTAINMENT.

It will save Lanternists much annoyance and expense if, before starting for an entertainment, they examine the following lists to make sure that the Gas Cylinder equipment is right, and nothing left behind :—

LANTERN FITTED WITH BLOW-THROUGH JET.

- Usual Lantern equipment.
- Cylinder of Oxygen.
- Oxygen Regulator.
- Valve Key.
- Gland Nut Spanner.
- Ample rubber tubing for both Oxygen and Coal-gas supply.
- Limes.

LANTERN FITTED WITH INJECTOR JET.

- Usual Lantern equipment.
- Cylinder of Oxygen.
- Special Oxygen Regulator.
- Valve Key.
- Gland Nut Spanner.
- Pressure rubber tubing for Oxygen.
- Ample ordinary rubber tubing for Coal-gas.
- Limes.

LANTERN FITTED WITH MIXED JET.

- Usual Lantern equipment.
- Cylinder of Oxygen.
- Cylinder of Coal-gas (or Hydrogen).
- Oxygen Regulator.
- Coal-gas Regulator.
- Valve Key.
- Gland Nut Spanner.
- Rubber tubing for both Oxygen and Coal-gas.
- Limes.

BLACKENING OF LIMES BY IMPURE COAL GAS.

Coal Gas, which has been compressed into Cylinders, is sometimes found to contain an impurity which, when the gas is used for lime-light, quickly blackens the lime and seriously reduces the amount of light obtainable. This impurity is a gaseous compound of iron, which is gradually formed by the action of a certain constituent of the gas upon the iron of the Cylinder. Coal-gas Cylinders which may cause trouble owing to the above reason will be treated by the Company in a special manner, which has been found in a large measure to remedy this defect, at a charge of 2s. to 3s. 6d. each, according to the size of the Cylinder.

No Lanternist's equipment is complete without pressure-gauges, and not only should Cylinders be gauged before starting for an entertainment to make sure that they contain sufficient gas, but all fittings should also be tried on the Cylinders to make certain that they fit and are in proper working order.

After gauging a Cylinder, and always after the valve has been opened test for leakage with water in the valve socket.

For General Hints to Cylinder Users, see pages 7 and 8.

LIME-LIGHT APPARATUS.

Special Lime-light Apparatus made to order.

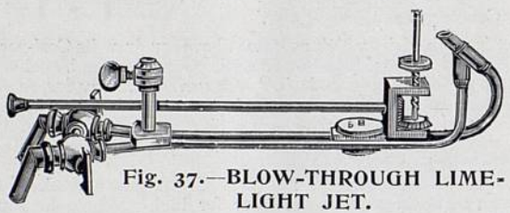


Fig. 37.—BLOW-THROUGH LIME-LIGHT JET.

15s.

Gases consumed { 5 ft. of Oxygen per hour.
6 ft. of Coal Gas ,,

Candle power 400–600.

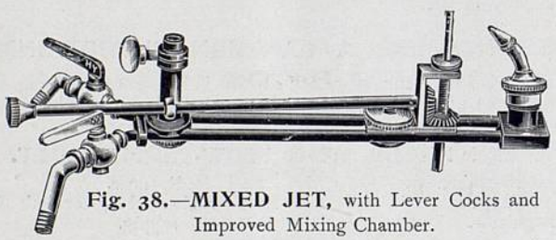


Fig. 38.—MIXED JET, with Lever Cocks and Improved Mixing Chamber.

30s.

Gases consumed { 6 ft. of Oxygen per hour.
7 ft. of Coal Gas ,,

Candle power 1,000–1,200.

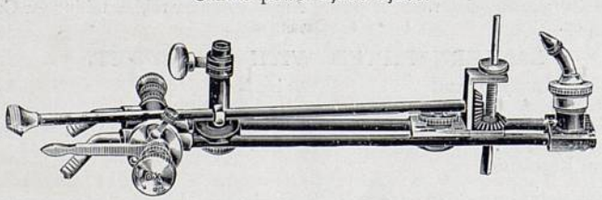


Fig. 39.—SPECIAL MIXED JET, with Double Valve cut off and Improved Mixing Chamber.

42s.

This Jet is capable of very delicate adjustment and rapid cut on or off of the gases.

Gases consumed { 6 ft. of Oxygen per hour.
7 ft. of Coal Gas ,,

Candle power 1,000–1,200.

LIME-LIGHT APPARATUS—*continued.*

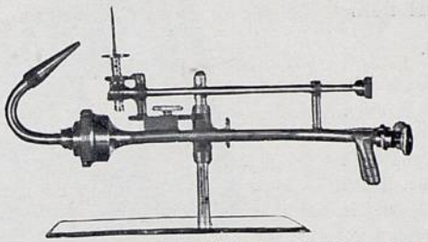


Fig. 40.—HIGH POWER MIXED JET.

30s.

Stand **2**s. **6**d. extra.

Gases consumed { 10 ft. of Oxygen per hour.
12 ft. of Coal-gas ,,

Candle-power 1,600–2,000.

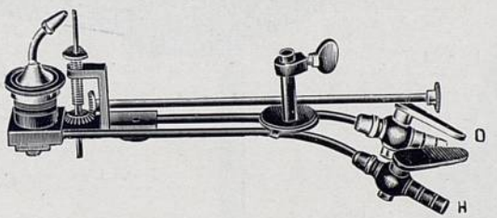


Fig. 41.—THE "INJECTOR" MIXED JET (Jackson's), **30**s.
HIGH-POWER DITTO FOR CINEMATOGRAPH, 37s. **6**d.

This is a full power mixed or chamber jet which can be worked with compressed Oxygen from a Cylinder and Coal-gas taken direct from the town supply. In order to obtain the Oxygen supply at the requisite pressure from Cylinders it must either be taken direct from the Cylinder or from an ordinary fine adjustment valve (Fig. 10) or from an automatic regulator set to deliver at from 12 to 15 lbs. pressure. (The regulator shown in Fig. 14 is specially recommended for use with this jet.)

The jet shown consumes the same amount of both Oxygen and Coal-gas as the mixed jets illustrated in Figs. 38 and 39, and gives the same amount of light. It can, however, be constructed to give higher candle powers if desired.

INSTRUCTIONS FOR USE.—Connect the Oxygen and Coal-gas supplies just as if working with a "blow-through" jet, using strong India-rubber tubing for the O supply, as this will have to stand considerably more pressure than is ordinarily required for a lime-light jet. Turn on the H supply and light the burner. It will be found that with the H tap fully open, more gas than is required will be supplied when the O is turned on. Regulate the gas supply and obtain the maximum lime-light in the ordinary way. After this the H tap will not require to be readjusted. To turn down the light simply turn off the O supply. It will then be found that a small H flame is left still burning, which is sufficient to keep the lime warm. To produce the light again simply turn on the O supply; the H supply will again be taken automatically from the mains. The simplicity of this adjustment is a great convenience in actual use.

Snapping, when turning off, is sometimes caused by a checked supply of Coal-gas. The supply passages for the Coal-gas should be large enough to pass to the jet at town's pressure the full quantity of gas which the jet consumes when working at full power. This applies also to the combination of two or three jets used for dissolving with ordinary dissolving taps. The H passages in some dissolving taps require opening out a little in order to satisfy this requirement. A better plan, however, is to connect the jets directly with the town's supply by means of a branch pipe or tee piece. The dissolving is then done wholly by the O supply.

Turning on the O too strongly does not cause passage of the O into the H main. The more the O is turned on the greater is the suction in the H pipe. The jet is therefore a "safety jet."

The chief advantage of the jet is briefly that it combines the efficiency of a mixed jet with the safety and economy of a "blow-through" jet. Compared with the ordinary mixed jet it soon saves its cost in compressed Coal-gas. Compared with the "blow-through" jet it gives twice the quantity of light with the same safety and cheapness.

Fig. 42.—LIME-LIGHT BOX.

£3. 0s. 0d.

This Lime-Light Box is suitable for ordinary stage lighting. It is strongly constructed, and fitted with a 6-inch plano-convex lens. It is fitted with a mixed jet similar to Fig. 38, and is supplied with gelatine films for colour effects.

This Lime-Light Box, complete with gelatine colours, can be obtained on hire at **5s.** per night.

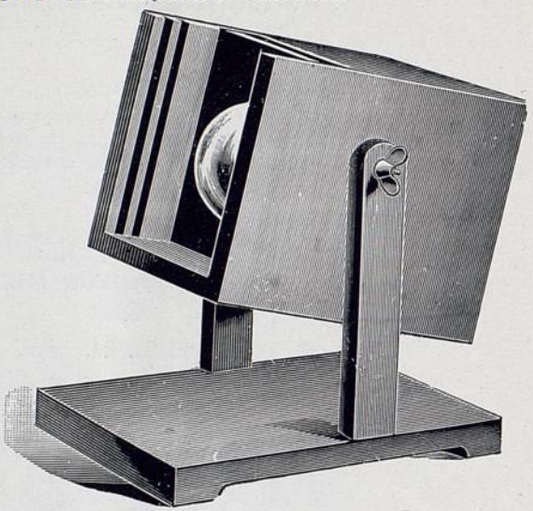


Fig. 43.—COMBINED REFLECTOR AND MIXED JET.

Complete as shewn,

£2. 8s. 3d.

Mixed Jet as illustrated (without connections),

£0. 7s. 6d.

Reflector as illustrated (without connections),

£1. 15s. 0d.

NOTE.—The above Reflector and Jet are admirably adapted for lighting large stages or for other purposes where a powerful projected light is required.

To obtain the best results about 10 ft. of each gas is required per hour.

These Lights were very successfully employed for lighting up the stages at Olympia and the Earl's Court Theatre, where flooding lights of great power had to be projected considerable distances.

This Reflector and Jet complete as shewn can be obtained on hire at **5s.** per night.

SUNDRIES.

SPECIAL ARMOURED ASBESTOS-COVERED RUBBER HOSE FOR BLOW-PIPES AND METAL CUTTERS		**1s. 3d.** and **1s. 6d.** per foot.
SPECIAL RUBBER TUBING FOR INJECTOR JET		**9d.** and **1s. 3d.** per foot.
BEST RUBBER GAS TUBING		**6d.** ,,
FLEXIBLE METALLIC GAS TUBING		**8d.** ,,
PUSH-ON CONNECTIONS FOR DITTO		**8d.** each.
LIMES, best hard Nottingham, suitable for all the jets illustrated above, except No. 43	per box of 1 doz.	**2s. 6d.**
LIMES, best hard Nottingham, suitable for all the jets illustrated above, except No. 43	per box of six	**1s. 9d.**
LIMES, large size, specially made for No. 43	per box of nine	**3s. 3d.**
LIMES, special, for high-power mixed jet No. 40	per box of six	**2s. 6d.**

BLOWPIPES.

Special Industrial Rates are quoted for OXYGEN, COAL-GAS and HYDROGEN for Blowpipe purposes.

BLOWPIPE NOTES.

The value of the Oxy-Hydrogen and Oxy-Coal-gas Blowpipe for brazing, lead burning, and many other purposes involving high temperatures, is well known, and the facility with which these gases can now be obtained, together with marked improvements in the construction of the Blowpipe, have extended its use very much in recent years.

The value of the Oxy-Hydrogen and Oxy-Acetylene Blowpipes for the welding of metals by fusion is now also becoming generally recognised, and we anticipate that in a few years this application of the Blowpipe will eclipse all others.

One of the principal advantages of the Blowpipe system of jointing metals by simple fusion is that as the heat can be locally applied, the parts of complicated structures can be fitted together and welded in position.

In many cases where electric welding has hitherto been the only possible substitute for mechanical joints the Blowpipe can be more profitably employed, and in a large variety of work the Blowpipe can be used where electric welding is impracticable. In actual use it is claimed to be both cheaper and simpler than electric welding, and whereas a Blowpipe weld can, in skilful hands, be effected without altering the character of the metal, an electric weld tends to harden the metal, and render it brittle where jointed.

An electric welding installation is expensive. On the other hand the cost of a Blowpipe equipment is insignificant, and proportionate to the scale on which it is employed.

Acetylene is of a higher calorific value than Hydrogen, and the temperature of the flame produced in the Oxy-Acetylene Blowpipe is considerably greater than that of the Oxy-Hydrogen one. The chemical and physical properties of Acetylene are such that when the gas is burned in Oxygen at the nozzle of a Blowpipe, although the flame produced is intensely hot it is of a reducing rather than an oxidising character. The flame is therefore one in which the fusion of metal can be effected without oxidation or deterioration in quality.

Considerable time and skill have, in recent years, been expended in perfecting the design of Blowpipes. With the Oxy-Hydrogen Blowpipe both gases are usually employed under pressure. With the Oxy-Acetylene Blowpipe Oxygen is always used under pressure. The economical advantage, however, of drawing Acetylene from a Generator has led to the introduction of specially constructed Injector Blowpipes in which Oxygen discharged from a Cylinder under pressure is caused to draw the Acetylene forward and then eject the mixed gases under a reduced pressure through the nozzle of the Blowpipe.

A special pamphlet is issued by the Company on the Oxy-Acetylene System of welding, giving full particulars of the apparatus employed and the class of work which can be dealt with.

This pamphlet will be forwarded on application to any of the Company's Works.

The Company also will be pleased either to give demonstrations and instructions at any of their Works, or they will arrange to send experienced workmen to give Blowpipe demonstrations in any works where the adoption of the system is contemplated.

NOTE.—The Blowpipes illustrated below are amongst the most efficient types now on the market. There are others which may be equally good, but of these the Company cannot speak from practical experience. Any of the types illustrated below will be sent to customers on approval for trial. From the particulars given customers will be enabled to judge approximately of the size and type of Blowpipe best suited to their requirements. The Company are prepared to design and manufacture Blowpipes for special work.

OXY-COAL GAS BLOWPIPE SYSTEM.

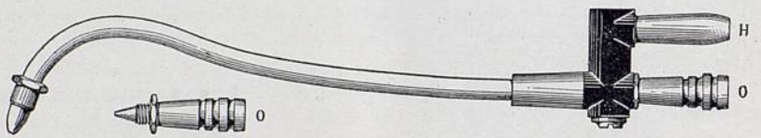


Fig. 44.—OXY-COAL GAS BLOWPIPE FOR LEAD BURNING.
Supplied with 2 Nozzles and Wind Shield, **8**s. **6**d. each.
Extra Injectors with Nozzle, **1**s. **6**d. per set.

In the Oxy-Coal Gas System of lead burning Oxygen takes the place of air, and ordinary Town gas takes the place of Hydrogen as used in the old system.

The Blowpipe is an ordinary lead burner's blowpipe with two inlets, one for Oxygen (O), and the other for Coal Gas (H). The Oxygen inlet is constructed in the form of an injector (as illustrated separatively above), by means of which the pressure of the Oxygen (about 15 lbs. per square inch) coming from the Cylinder through a Regulator (Fig. 14) is made to suck the necessary supply of Coal Gas through the inlet H of the Blowpipe, and deliver the gases well mixed and under sufficient pressure to the Burner nozzle. With the 2 nozzles supplied lead sheets up to $\frac{1}{4}$ inch thick can be burnt together. Extra sets as indicated above are supplied as required for greater thicknesses.

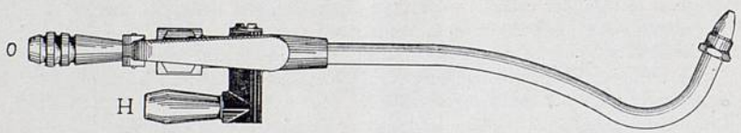


Fig. 45.—OXY-COAL GAS BLOWPIPE FITTED WITH THUMB VALVE ON OXYGEN INLET.
Supplied with 2 Nozzles and Wind Shield, **15**s. each.
Extra Sets, as above, **1**s. **6**d. each.

The Oxygen supply in this Blowpipe is automatically shut off when the thumb pressure is removed from the valve lever. Wastage in Oxygen can thus be prevented in short intervals when the Blowpipe is not at work and when it is not worth while to cut off the main supply.

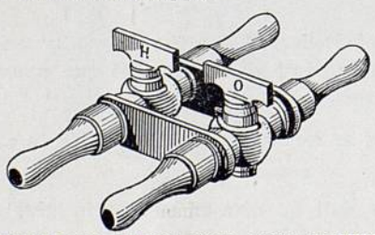


Fig. 46.—SHOULDER TAPS FOR USE WITH THE LEAD BURNING BLOWPIPE (Figs. 44 and 45).
5s. each.

OXY-COAL GAS BLOWPIPE SYSTEM—*continued.*

Some of the more obvious practical advantages of the Oxy-Coal Gas System are enumerated below :—

(1) **Economy.**

To supply the requirements of one Lead Burner the comparative cost ***per week*** of the two systems is approximately as under :—

Hydrogen-Air System.

Zinc and Sulphuric Acid	£0 11 0
Boy's Wages	0 10 0
Total	£1 1 0

Oxy-Coal Gas System.

Oxygen delivered in Cylinder on the user's Works ...	£0 10 0
Coal Gas from Town supply	0 0 6
Total	£0 10 6

Saving per Week 10s. 6d.

(2) The Hydrogen Generator is dispensed with.
(3) The air bellows is dispensed with, and consequently the services of a boy are not required.
(4) Instead of having to move a heavy Hydrogen Generator and air bellows from one job to another, it is generally only necessary to move a light Cylinder containing the Oxygen required.
(5) No apparatus to get out of order involving expensive delays and repairs.
(6) As no Zinc or Sulphuric Acid are used, there is no deleterious matter to be carried through the Blowpipe to act injuriously on the lead seam.
(7) No Pre-warmer required on heavy work.
(8) No gas generated when the Blowpipe is not in use, and consequently there is no waste of gas and no charge to withdraw overnight.
(9) The Oxy-Coal Gas Blowpipe, shoulder taps, and connections are similar to those employed in the old system, and the other connections are simpler and more accessible.

The Oxy-Coal Gas Blowpipe has been in constant successful use for several years in many Chemical, Electrical, and other works where Lead Burners are employed.

It is suitable for ordinary flat work, horizontal and upright joints, overhead patching, and the jointing of ordinary lead piping.

It is suitable also for many ordinary plumbing jobs as a substitute for soldering.

A complete equipment will be sent by the Company on approval (for sale or return), and a cylinder of Oxygen will be supplied free of cost to Technical Colleges, Lead Burners, Master Plumbers, or others who are disposed to give the process a trial, and it will be found that any workman conversant with the Hydrogen and Air system of lead burning will experience no difficulty in operating this Blowpipe.

The Company will be pleased to give demonstrations and instructions in the working of the Blowpipe at any of their own Works, or they will, if desired, arrange to send an experienced workman to give a Blowpipe demonstration in the works of any intending purchaser.

All Lead Burners are invited to apply to the Company for their special pamphlet on this subject.

OXY-HYDROGEN BLOWPIPE SYSTEM.

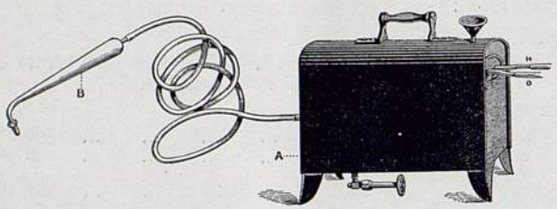


Fig. 47.—OXY-HYDROGEN BLOWPIPE AND SAFETY MIXING CHAMBER.

Price complete, with six spare nozzles for blowpipe, £4. 6s.

This is the latest form of Oxy-Hydrogen welding apparatus. The gases are conveyed from their respective cylinders to the safety mixing chamber **A** through separate pipes, and issue therefrom by a single pipe to the burner **B**. The Burner can be fitted with nozzles of various sizes suitable for all classes of work. This system of welding is extensively in use on the Continent, and is at present being successfully employed in this country for welding together steel tubes, repairing iron castings and other purposes.

HEAT OBTAINABLE.—When the gases are burned in the proportion of two volumes of hydrogen to one volume of oxygen (the proportions required for complete combustion), the temperature of the flame produced is about 6,000 degs. Fah. In order, however, to ensure a non-oxidizing flame which cannot injuriously affect the character of the metal operated upon, it is found that the gases must be burned in the proportion of about five volumes of hydrogen to one volume of oxygen, so that the temperature of the flame produced by this Blowpipe in actual operation is probably about 4,000 degs. Fah.

OXY-ACETYLENE BLOWPIPE SYSTEM.

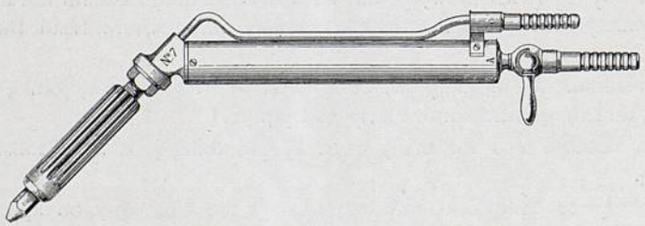


Fig. 48.—OXY-ACETYLENE INJECTOR BLOWPIPE (FOUCHÉ'S PATENT).

This Blowpipe, which acts on the well-known injector principle, is very carefully designed and proportioned to meet all the special conditions with which an Oxy-Acetylene blowpipe must comply. It is perfectly safe for use, being so constructed, even in the largest sizes, that the flame cannot strike back. The gases are well mixed in the injector chamber before they issue from the nozzle of the blowpipe, and the nozzle itself is so constructed that carbonaceous deposit in the orifice is entirely obviated.

The Fouché Blowpipe is made in nine sizes, prices and particulars of which are given in the table on opposite page. From these particulars, which give the approximate thickness of iron or steel plates for the welding of which each size is best adapted, together with the approximate quantities of each gas consumed per hour, customers will be able to select the size of blowpipe suitable for their particular requirements.

All blowpipes are accurately and carefully adjusted. They must not be taken to pieces, and the hole in the nozzle of the blowpipe must under no circumstances be enlarged.

Oxy-Acetylene Blowpipe System—*continued.*

TABLE OF FOUCHÉ BLOWPIPES.

No. of Blowpipe.		3	4	5	6	7	8	10	12	15
Approximate thickness of plate joint		$\frac{3}{64}$"	$\frac{3}{32}$"	$\frac{3}{32}$" to $\frac{1}{8}$"	$\frac{1}{8}$" to $\frac{3}{16}$"	$\frac{3}{16}$" to $\frac{9}{32}$"	$\frac{9}{32}$" to $\frac{3}{8}$"	$\frac{3}{8}$" to $\frac{1}{2}$"	$\frac{1}{2}$" to $\frac{5}{8}$"	$\frac{5}{8}$" to $\frac{3}{4}$"
Approximate Consumption of gas per hour.	Oxygen	c. ft. 4·25	c.ft. 7·5	c. ft. 12·0	c.ft. 17·0	c. ft. 25·0	c. ft. 37·0	c. ft. 60·0	c. ft. 85·0	c. ft. 125·0
	Acetylene	c.ft. 2·5	c.ft. 4·5	c.ft. 7·0	c.ft. 10·0	c. ft. 15·0	c. ft. 22·0	c. ft. 35·0	c. ft. 50·0	c. ft. 75·0
Price		52/–	60/–	76/–	92/–	112/–	136/–	148/–	160/–	184/–

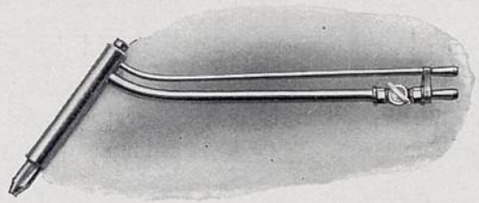
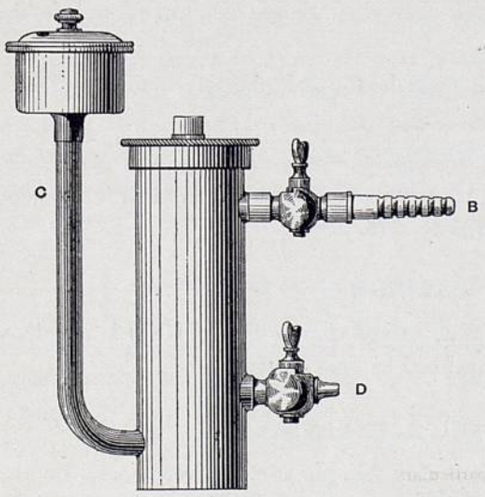


Fig. 49.—OXY-ACETYLENE INJECTOR BLOWPIPE.

(JACKSON'S PATENT.)

£1. 15s. 0d. and upwards.

This Blowpipe is recommended for light work.



With the Injector Blowpipes (Figs. 48 and 49) this Valve is a desirable addition. It is fixed in the piping between the acetylene holder and the blowpipe, as near to the latter as it can conveniently be placed.

Water is poured in through the pipe **C** when all three taps are open until it overflows at **D** when that tap is closed. The inlet pipe is then attached at top, and the outlet pipe at **B**, and the acetylene should be allowed to flow through till all air has been displaced before being lighted at the nozzle of the blowpipe. Without this Valve, in the event of the nozzle getting blocked through any cause when the Blowpipe is at work, there would be a liability in the hands of a careless workman for oxygen to get back into the acetylene pipe, or even into the acetylene holder. The Valve, however, effectually prevents this, for the moment back-pressure occurs, water is driven up the acetylene pipe, whilst at the same time the water seal on the filling pipe **C** is destroyed, and all the oxygen escapes into the atmosphere.

50.—HYDRAULIC BACK-PRESSURE RELEASE VALVE.

£1. 16s. 0d.

ACETYLENE GENERATING APPARATUS

For use with Oxy-Acetylene Injector Blowpipes.

This blowpipe system does not necessitate the use of any particular form of Acetylene Apparatus, and any existing well-designed generator complying with the recommendations of the British Acetylene Association may be employed.

In the selection and arrangement of the Apparatus, however, the following points should be more especially observed :—

(1) That the generator is of ample capacity for the continuous production, without heating, of the maximum quantity of Acetylene required.

(2) That whether the system employed be automatic or non-automatic, the holder is of sufficient capacity to obviate any loss of gas due to production when the supply to the blowpipe is shut off.

(3) That the design precludes any appreciable admission of air to the Apparatus in re-charging with carbide.

(4) That the limit of pressure in any part of the Apparatus shall not exceed 20 inches of water.

(5) That the size of pipes conveying the gas is proportioned to the maximum rate of generation.

(6) That it shall be impossible to seal the generating apparatus hermetically.

The Company is prepared to supply well tested complete Apparatus, fulfilling all the above conditions, to suit the requirements of their customers, at maker's prices, varying from £25 to £75.

CARBIDE

at market prices can be obtained from various depôts in the United Kingdom, full particulars of which will be furnished by the Company.

COST OF ACETYLENE.

At the present price of Carbide (say 14s. per cwt., delivered), and on the assumption that 4·5 cubic feet of Acetylene are produced per lb. of Carbide the cost of Acetylene generated on the consumer's Works is, with labour, approximately 35s. per 1,000 cubic feet.

NOTE ON THE CALORIFIC VALUE OF THE OXY-ACETYLENE FLAME.

The Oxy-Acetylene welding system affords to Engineers the most powerful and valuable method yet discovered of dealing simply and economically with an immense variety of metallurgical operations which have hitherto been carried out under less favourable conditions.

Acetylene (C^2H^2) is nearly as heavy as air, its density being 13 where air is taken at 15. It is an endothermic gas which is decomposed at the moment of combustion into its elements Carbon and Hydrogen, and by this decomposition alone about 300 B.T.U. are generated per cubic foot of the gas. The remaining heat is furnished mainly by the combustion in Oxygen of the Carbon into Carbon dioxide and in a lesser degree by the combustion of Hydrogen into water vapour, the total heat generated per cubic foot of Acetylene being about 1,500 B.T.U.

Theoretically $2\frac{1}{2}$ volumes of Oxygen are required for the complete combustion of 1 volume Acetylene. In practice, however, with the Oxy-Acetylene blowpipe it is found that the best welding results are obtained with 1·7 volumes of Oxygen to 1 volume of Acetylene.

The flame thus produced has in its centre a small white cone, at the apex of which the temperature is about 6,000° Fahr. This flame consists almost entirely of Carbon monoxide, which is being converted at its extremity into Carbon dioxide. Round the flame is a relatively cool jacket of Hydrogen, which, not being able to combine with Oxygen at the very high temperature in the immediate neighbourhood of the flame, remains temporarily in the free state and thus protects the inner zone from loss of heat whilst excluding the possibility of oxidation, which is a difficulty other methods of welding have to contend with.

Autogenous welds can therefore be effected by means of the Oxy-Acetylene blowpipe without any deleterious effect upon the metal. The heat in addition to being greater than that obtainable from any other blowpipe system is also more concentrated, whilst the flame being luminous, and in the form of a short steady jet, very little practice is required to make an unskilled workman proficient in the manipulation of the blowpipe.

GENERAL APPLICATIONS OF THE OXY-ACETYLENE BLOWPIPE.

It is impossible to enumerate in anything like detail all the work which may be executed by the Oxy-Acetylene blowpipe rapidly and economically, but the following are some of the applications for which it has already been advantageously employed.

IRON AND STEEL.

The fusion welding (in place of brazing) of bicycle frames, forks, tee standards, wheel rims, etc.

The fusion welding of frames, wheel rims, etc., for motor cars.

In the manufacture of iron or steel motor or other boats as a substitute for rivets.

The fusion welding of domestic and other hot water boilers.

The repair of steam boilers and other apparatus *in situ.*

The fusion welding of steel or iron tanks, etc.

In the manufacture of safes.

The fusion jointing of pipes of every description and shape for steam superheaters, etc.

The fusion welding of all joints in metallic casks, petroleum barrels, etc.

As a substitute for rivetting in thin sheet ironwork, such as enamel ware.

Artistic ironwork.

The repair of cracks, blisters, and flaws in malleable iron and steel castings, forgings, etc.

As a substitute for brazing in many instances.

COPPER.

As a substitute for brazing in copper work of various descriptions.

By means of the blowpipe, copper pipes, and many kinds of sheet copper structures can be fused together as one pipe, where brazing would otherwise be necessary.

From the above particulars some opinion can be formed of the work for which the blowpipe may be advantageously used. The Company will at any time be glad to treat samples of work free of charge, and engineers, manufacturers and others contemplating the adoption of this blowpipe system are cordially invited to send them samples for this purpose. All such samples will be promptly dealt with and returned to the sender for inspection.

Engineers are invited to apply to the Company for their special pamphlet on the welding of metals by the Oxy-Acetylene Blowpipe.

OXY-ACETYLENE HIGH PRESSURE BLOWPIPE SYSTEM.

In this system Oxygen and Acetylene are both supplied under pressure. Oxygen from an ordinary trade Cylinder, and Acetylene from a Cylinder in which it is dissolved in a porous material soaked in Acetone. Acetone is a liquid hydro-carbon which has the property of absorbing 25 times its own volume of Acetylene at atmospheric pressure, and it continues to do this for every atmosphere of pressure that is applied to the gas. This system affords an excellent and safe method of transporting Acetylene, and it supplies Engineers with the means of using the Oxy-Acetylene blowpipe in its most portable form. It has many useful applications, and for repair work generally, but more especially on board ship, this system is unrivalled.

Fig. 51.

The illustration (Fig. 51) indicates the portability of the apparatus required for this system of welding. The encased cylinder on the right contains 200 cubic feet of Acetylene, and reference to the table on page 33 will indicate the amount of welding which can be effected with this quantity of gas. Either of the Blowpipes illustrated in Figs. 48 and 49 can be equally well employed with this system, and Cylinders of dissolved Acetylene varying in capacity from 60 cubic feet to 200 cubic feet can be procured through the Company, or direct from The Acetylene Illuminating Company, Limited, of 268, South Lambeth Road, London, S.W., and Newcastle-on-Tyne, who are the sole compressers of this gas.

The price of Dissolved Acetylene (on Compressor's Works in London) is 2d. per cubic foot, and arrangements can be made for the hire of Cylinders.

FLETCHER'S OXY-COAL GAS BLOWPIPES FOR BRAZING.

These Blowpipes give a diffused flame of high temperature. They are not suitable for welding purposes, but are extensively employed by coppersmiths for brazing.

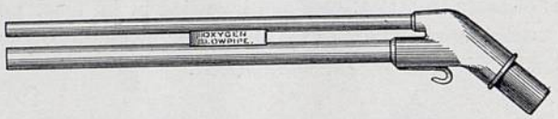


Fig. 52.—FLETCHER'S OXY-COAL GAS BLOWPIPE, No. 1 ... £0 8 6
,, ,, ,, ,, ,, 2 ... 0 10 0
,, ,, ,, ,, ,, 3 ... 0 12 0

No. 1 size requires about 7 cubic feet of Oxygen per hour, and about as much Coal-gas as an ordinary $\frac{1}{4}$ inch gas pipe will supply, in order to obtain the maximum power. This blowpipe is powerful enough to easily fuse a $\frac{1}{4}$ inch rod of wrought-iron. No. 2 size requires about 20 cubic feet of Oxygen per hour, and a $\frac{3}{8}$ inch gas supply to obtain the maximum power. This blowpipe will easily fuse a $\frac{1}{2}$ inch rod of wrought-iron, and is the most suitable for average workshop brazing purposes. No. 3 size requires about 40 cubic feet of Oxygen per hour, and a $\frac{1}{2}$ inch gas supply to obtain the maximum power. This blowpipe will fuse heavy bars of wrought-iron, and is suitable for massive brazing.

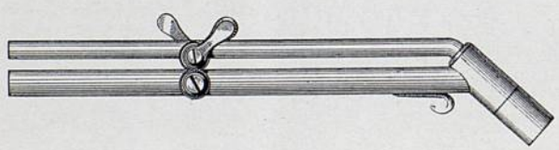


Fig. 53.—FLETCHER'S OXY-COAL GAS BLOWPIPE, with taps, **No. 1 £0 13 0**
,, ,, ,, ,, ,, ,, 2 0 16 0
,, ,, ,, ,, ,, ,, 3 0 18 0

NOTE.—The difference between this blowpipe and that illustrated Fig. 52, is that this one is provided with means for proportioning the gases in the blowpipe itself. Where this is not provided the gas may be proportioned by means of the cylinder valve or fine adjustment valve attached to same. Where this form of blowpipe is used, a regulator for reducing the cylinder pressure must be employed. The blowpipe can then be used at any desired distance from the cylinder, and all adjustment of the gases made by means of these taps.

BLOWPIPES OF ALL DESCRIPTIONS MADE TO ORDER.

METAL CUTTING BY OXYGEN.

During the last few years oxygen has come very prominently into use for the purpose of cutting wrought iron and steel plates and structures of all sorts. The process is based on the well-known fact that a jet of Oxygen directed upon a previously heated spot of metal ignites it, with the result that the metal acting as its own fuel burns away rapidly in the form of iron oxide.

In the year 1889 the late Mr. Thomas Fletcher of Warrington (whose blowpipes are illustrated on the opposite page) shewed that after heating an iron plate to incandescence by means of the Oxygen and Coal Gas flame obtained with one of his blowpipes it was possible by largely increasing the supply of Oxygen to "fuse" holes and even slots in the plate.

Twelve years later the same process was practically applied by Dr. Menne of Germany to the opening up of twyers in blast furnaces which had become blocked by the solidification of metal.

The use of Oxygen for this latter purpose proved so successful that its value in the cutting of metal was again suggested. Theoretically, once iron is ignited in Oxygen, if a powerful jet of the gas is maintained in operation, it should be possible to burn away the metal without any auxiliary source of heat. Oxide of iron, however, is formed at a comparatively low temperature and lacks fluidity. It was found difficult in practice to eliminate all the oxide which was formed. Much of it adhered to the partially molten metal thus preventing the intimate contact of metal and gas, with the result that combustion soon failed and the cutting operation was arrested. The process was in consequence intermittent, the consumption of Oxygen wasteful, and the cut wide, coarse, and irregular. In 1904 a cutting blowpipe, which is a very simple solution of this difficulty, was patented and subsequently introduced by the Société Anonyme L'Oxhydrique

Internationale of Belgium. It consists essentially of a blowpipe with an additional passage through which an independent and separately controlled stream of Oxygen is supplied at the discretion of the operator. This separate supply of Oxygen may be discharged through the centre of the blowpipe, in which case the mixed gases employed for heating are conducted through an annulus surrounding it, or the supply may be brought in a passage immediately behind the heating flame. The latter is the method preferred by the inventors, and for Oxygen cutting machines (see our special pamphlet on Metal Cutting), it is probably the best, and most economical in gases. For the ordinary hand cutters, however, as illustrated in Figs. 54 and 55, the difference in construction is unimportant, and each method is equally suitable.

This simple expedient of maintaining an independent heating jet in operation whilst the cutter is travelling renders the cutting operation continuous. It furnishes the quantity of additional heat necessary to render the oxide fluid so that it can be blown away through the cut by the separate jet of Oxygen, and the heating is so rapid and local that a clean narrow cut is effected through the metal without any deteriorating effect upon its quality and at a speed of travel which is comparable with hot sawing.

This subject is fully dealt with in a special pamphlet issued by the Company in which various cutting machines are illustrated and described.

The hand cutters illustrated here in Figs. 54 and 55 do not work with the same accuracy and precision as these machines, but they will be found invaluable tools for cutting away defective parts in boiler furnaces prior to welding or for cutting out furnaces altogether, and for general use in an immense variety of similar work.

By an arrangement with L'Oxhydrique Internationale the Company has acquired their British patents with the exclusive right to manufacture and sell Oxygen cutting apparatus under those patents in the United Kingdom. The purchase therefore of any Oxygen Cutter from the Company carries with it the full and unrestricted right to use it in this country for any purpose whatsoever.

HAND CUTTERS.

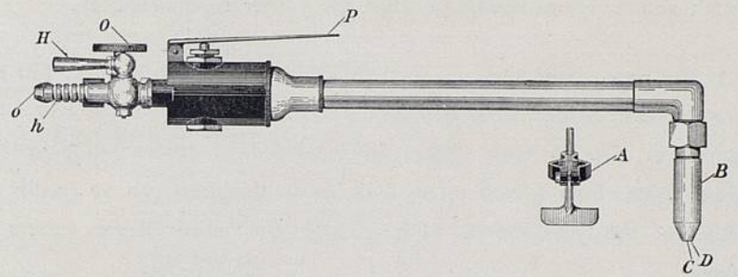


Fig. 54.—UNIVERSAL METAL CUTTER (Type 1), with guide ... £9 0 0

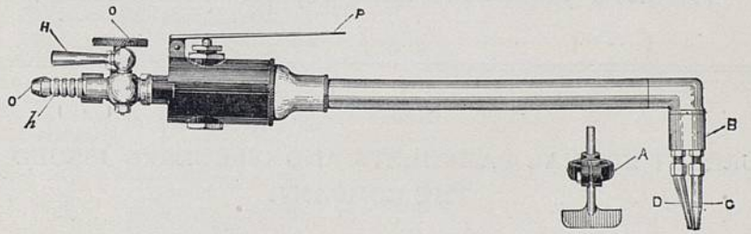


Fig. 55.—UNIVERSAL METAL CUTTER (Type 2), with guide ... £9 0 0

The Universal Metal Cutters are manufactured exclusively by the Company.

Each type is supplied either for use with coal gas or acetylene, and in ordering care must be taken to specify the gas which will be employed.

The Cutters are lettered similarly. High pressure or preferably armoured tubing for the Oxygen supply (Sundries, page 28) must be securely attached at O (in Figs. O is behind branch h). Ordinary rubber tubing or preferably armoured tubing for the combustible gas must be securely attached at h. Heating in each Cutter is obtained on the injector principle, the gases being separately adjusted by valves O and H. These gases are discharged through the passages D.

Oxygen for cutting is separately controlled by means of the thumb lever valve P. The separate jet of Oxygen for cutting is discharged through the passages C.

A is an adjustable sliding guide which can be attached to the Cutter heads at B in order to maintain an uniform distance between the Cutter and the work and to insure steadiness when the Cutter is in operation.

As the pressure of Oxygen required for cutting varies between two and five atmospheres according to the thickness of plate, high pressure Regulators as shown in Fig. 15 must always be employed in connection with these Cutters. Plates from $\frac{1}{4}$ inch up to 2 inches in thickness can be readily cut by either of the types shewn. For greater thicknesses larger cutters are required.

(For further particulars see Special Pamphlet on Metal Cutting.)

CURRENT SPECIAL PAMPHLETS AND CIRCULARS ISSUED BY THE COMPANY.

Illustrated Pamphlet on—

"The Welding of Metals by the Oxy-Acetylene Blow Pipe,"
with Photographs of work done.

Handbook on—

"Oxy-Acetylene Welding."

Illustrated Pamphlet on—

"Metal Cutting by Oxygen."

Illustrated Pamphlet on—

"Apparatus for the Self-Intensive Liquefaction of Gases."

Illustrated—

Annual Pocket Book containing Useful General Information for Gas Cylinder uses.

Pamphlets or Circulars on—

"The Oxy-Coal Gas System of Lead-Burning."
"Nitrogen."
"Nitrous Oxide."
"Carbonic Acid."

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