Flat 2,
Queen Alexandra Hospital,
Cosham,
Portsmouth.

10th March 1961

Dear Sir,

Could you please tell me whether equal portions of nitrous oxide and oxygen would come off a cylinder containing equal parts of these two gasses. I realise that over a certain pressure most of the nitrous oxide would be in the liquid phase.

By looking up my physics I should be able to work it out, but it seems easier to write to you and it will probably be more informative.

Yours faithfully,

M.E.TUNSTALL (DR)
Joint Senior Anaesthetic Registrar,
Portsmouth & Oxford United Hospitals.

The Manager,
British Oxygen Co, Ltd.,
Gt.West Road,
Brentford,
Middlesex.

THE BRITISH OXYGEN COMPANY LIMITED

SALES DIVISION—MEDICAL DEPARTMENT

GREAT WEST ROAD BRENTFORD MIDDLESEX

TELEPHONE: ISLEWORTH 3123 TELEX 22608 TELEGRAMS: OXYGEN BRENTFORD HOUNSLOW

OUR REF. M/WDH/MCE YOUR REF.

13th March, 1961.

Dr. M.E. Tunstall, M.B., B.S., MRCS., LRCP., etc.,
Flat 2,
Queen Alexandra Hospital,
Cosham,
Portsmouth, Hants.

Dear Dr. Tunstall,

Nitrous Oxide/Oxygen Mixture

I thank you for your letter dated the 10th instant.

I have referred your enquiry to Dr. A. Bracken of our Scientific Centre, Morden and no doubt you will be receiving a line from him in the course of the next few posts.

Yours sincerely,

W.D. Hollidge

W.D. Hollidge
Commercial Sales Manager.

THE BRITISH OXYGEN COMPANY LIMITED

DEER PARK ROAD
LONDON · S·W·19

TELEPHONE · LIBERTY 6677

TELEGRAMS:
BRITOXYGEN · LONDON · S.W.19

YOUR REF.

OUR REF. AB/CDL

15th March,1961.

Dr.M.E.Tunstall,
Queen Alexandra Hospital,
COSHAM.

Dear Dr.Tunstall,

NITROUS OXIDE/OXYGEN MIXTURE.

This letter follows that from our Mr.Hollidge of 13th March 1961,referring to your letter of 10th March,1961.

We are checking the literature information on the mutual solubilities of oxygen and nitrous oxide at room temperature, but high pressure. So far we have not come across any firm information. Arguing by analogy with carbon dioxide and oxygen mixtures, one would expect nitrous oxide to exist largely in the liquid phase, so that at the present state of our knowledge, we cannot recommend mixing the two gases in the cylinder except under special conditions.

Yours sincerely,
A.Bracken
A.Bracken,
for Manager,Chemical Department.

Your Ref: AB/CDL

Flat 2,
Queen Alexandra Hospital,
Cosham,
Portsmouth.

A. Bracken, Esq.,
Manager,
Chemical Department,
British Oxygen Company, Ltd.,
Deer Park Road,
London, S.W.19.

17th March, 1961.

Dear Mr. Bracken,

Thank you for your letter of 15th March. You have not said that equal quantities of nitrous oxide and oxygen in a cylinder would not come off in the same proportions! My interest in this problem is twofold. Firstly one cylinder capable of giving off equal parts of oxygen and nitrous oxide would go a long way towards enabling Midwives to give safer and more satisfactory analgaesia to their patients. Secondly, with your new light-weight cylinders, I visualise a portable anaesthetic machine consisting of just one cylinder and a circle-absorber system. By cutting down the input of the 50:50 N_2O/O_2 mixture to such a system the inhaled nitrous oxide concentration in oxygen could be increased to anything up to 80%. It is possible to give an anaesthetic for every known operation with nitrous oxide, oxygen and intravenous agents only. My present enthusiasm for the idea makes me anxious that you should pursue the idea further.

I would be glad of your opinion on this matter?

Yours sincerely,

M. E. Tunstall, M.B., F.F.A.R.C.S.,
D.Obst.R.C.O.G.

Joint Senior Registrar in Anaesthetics
Portsmouth Group and United Oxford
Hospitals

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YOUR REF. Your letter d/d 17.3.61.

OUR REF. AB/CDL

24th March, 1961.

Dr.M.E.Tunstall,M.B.,F.F.A.R.C.S.,
D.Obst.R.C.O.G.,
Flat 2,
Queen Alexandra Hospital,
PORTSMOUTH.

Dear Dr.Tunstall,

NITROUS OXIDE OXYGEN MIXTURE.

You are quite right. I did not say that equal quantities of nitrous oxide and oxygen in a cylinder would not come off in the same proportions. What I was really stating was that we have no information on mutual solubilities of nitrous oxide in oxygen. Thus if one were content to restrict the cylinder pressure to some at present unknown figure, the contents of the unit would be gaseous, and in this case, one would draw off the mixture put in. I imagine though that you would not be very interested in cylinders containing much reduced quantities of gas, for example, at a total cylinder pressure of about 1000 p.s.i. and what would be nice to know, would be the maximum pressure which could be used in the cylinder. Since writing to you on the 15th March, I have verified that the literature is completely silent on this point, so really, I suppose what we must say is "We do not know the answer to your question".

We are very interested indeed to observe that you think there are possibilities in the use of the 50/50 N_2O O_2 mixture. It is a most ingenious idea that by using a closed circuit system, the patient would use up oxygen and thus increase the nitrous oxide concentration eventually up to 80%. You ask us to pursue the idea further, but we are in the situation where we have so many projects on hand, that we find it difficult to find time to interject others.

I will see what can be done however, and write to you again in due course.

Yours sincerely,

A.Bracken,
for Manager, Chemical Department.

THE BRITISH OXYGEN COMPANY LIMITED

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TELEGRAMS:
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YOUR REF.

OUR REF. AB/CDL

5th April,1961.

Dr.M.E.Tunstall, D.R.C.O.G.,F.F.A.R.C.S.,M.B.,
Upper Flat, Medical Quarters,
Queen Alexandra Hospital,
Cosham,
PORTSMOUTH.

Dear Dr.Tunstall,

NITROUS OXIDE OXYGEN MIXTURES.

I am most pleased to see from your welcome letter of 28th March that you would be able to help with any work we do in the clinical field, with the above mixtures. The present position is that we have not enough facts at our disposal on the purely physical side, but we are looking into this and in due course we will let you know of our results. This will take a little time of course as we must fit it in with our other existing work.

Yours sincerely,
A.Bracken
A.Bracken,
for Manager,Chemical Department.

THE BRITISH OXYGEN COMPANY LIMITED

SALES DIVISION—MEDICAL DEPARTMENT

GREAT WEST ROAD BRENTFORD MIDDLESEX

TELEPHONE: ISLEWORTH 3123 TELEX 22608 TELEGRAMS: OXYGEN BRENTFORD HOUNSLOW

OUR REF. M/SPE/SAS YOUR REF.

3rd July, 1962.

Dr. M.E. Tunstall,
Nuffield Department of Anaesthetics,
The Radcliffe Infirmary,
Oxford.

Dear Dr. Tunstall,

Many thanks for your letter of the 27th June from which we were all very pleased to hear that the pre-mixed cylinders are being received so well by your midwives and patients.

We do appreciate the point made that the use of 2 x 24 cu.ft. pin index cylinders on a twin stand would overcome the difficulty of cylinder changing, but unfortunately, we are not in a position to provide this type of cylinder at present. The provision of suitable twin stands is also rather a problem at present as nothing of this kind exists in our range. Whilst this aspect will certainly be kept in mind, we hope you will feel that the present cylinders and equipment are sufficiently practical to enable you to complete this phase of the clinical trials.

Incidentally, I have now made arrangements with our works that all nitrous oxide/oxygen mixtures returned for refill shall be filled with a 60/40% N20/02 mixture and not 50/50%, as you are now concentrating entirely on the former for the purposes of these trials. I think it would be wise to mark, for my attention, all cylinders which are to be refilled under this arrangement so that I can personally see that the correct action is taken.

Yours sincerely,

S.P. Evans.

S.P. Evans,
Regional Sales Manager (Medical Products).

Evans re Aberdeen 23.9.62.

THE BRITISH OXYGEN COMPANY LIMITED

DEER PARK ROAD LONDON SW19

TELEPHONE: LIBERTY 6677 TELEGRAMS: BRITOXYGEN LONDON S.W.19

OUR REF. JWH/AB/BB YOUR REF.

11th August, 1961.

Dr. M.E. Tunstall, M.B., F.F.A.R.C.S.,
D.Obst. R.C.O.G.,
Flat 2,
Queen Alexandra Hospital,
Cosham,
PORTSMOUTH.

CONFIDENTIAL

Dear Dr. Tunstall,

MIXTURES OF NITROUS OXIDE & OXYGEN IN ONE CYLINDER

Dr. Bracken and I greatly enjoyed talking to you last Tuesday, and this letter confirms the points we made about the behaviour of nitrous oxide and oxygen under pressure. We would ask you to treat the contents of this letter as being in confidence until we have cleared the patent aspects. Thereafter, we will be delighted for you to publish the clinical results of your work in any way you think advisable.

Briefly, compressed gases act as solvents. This is the Poynting effect, and at a pressure of 2000 p.s.i.g. oxygen has a considerable solvent effect on liquid nitrous oxide, especially because the critical temperature of nitrous oxide is fairly low, 37°C. The preliminary results we have obtained and about which we told you, show that a mixture of 75% nitrous oxide, 25% oxygen v/v exists as a single gas phase in the cylinder. Since there is no separation of liquid, the composition of gas withdrawn from the cylinder is unchanged as the cylinder empties, and is the same whether the sample is taken from the top of the cylinder or the bottom.

We are not yet sure of the lowest temperature at which such mixtures can be stored without separation taking place, so for the present we are taking the view that such cylinders should be at normal room temperature when in use.

I would confirm that we will let you have a cylinder of 50% nitrous oxide, 50% oxygen, as soon as possible, and we are also making arrangements to get you a Boyle apparatus with suitable Rotameters so that you can give your patients oxygen, nitrous oxide/nitrogen mixtures such as we discussed.

I would take this opportunity of wishing you every success in your work.

Yours sincerely,

(J.W. Haworth)
Manager, Chemical Dept.