THE PROPAGATOR

MONTHLY NEWSLETTER OF THE ILLAWARRA AMATEUR RADIO SOCIETY
PO BOX 1838 WOLLONGONG NSW 2500

MAY 1981

MEETINGS ARE HELD ON THE SECOND MONDAY OF EACH MONTH (EXCEPT JANUARY) AT 7.30 P.M. IN THE CONGREGATIONAL HALL, CORNER OF COOMBE AND MARKET STREETS, WOLLONGONG. VISITORS ARE WELCOME TO ATTEND MEETINGS.

NOTICE OF MEETING:

The May general meeting of the Illawarra Amateur Radio Society will be held on Monday 11th May at 7.30 p.m. in the Congregational Hall, Coombe Street, Wollongong.

Proceedings will include the usual raffle, cup of tea, and club store.

NEWS FROM THE APRIL MEETING:

Attendance was down a little from usual - being only around the 50 mark. Several items of microwave and UHF equipment were auctioned; in most cases the bidding was hotly contested, with closing bids seemingly in direct proportion to the frequencies of operation. Once again Andrew VK2PHS and Dave VK2VAV carried off the bulk of equipment.

Keith VK2OB briefly demonstrated the Sony ICF-2001 general coverage receiver. Coverage is from 150kHz to 30 MHz, and 76 to 108 MHz, with push-button selection and digital readout. A substantial discount is available to purchases made through the Society.

Two digital watches were raffled - winners being Paul VK2ZQT and Gerry VK2APG.

LONG-RANGE VHF:

Almost everyone who listens on VHF becomes aware of the marked extension to the distances over which signals travel during "tropospheric" weather conditions and during seemingly random "sporadic E" conditions. The presence of water vapour at heights up to about 6,000 feet combined with the existence of a "temperature inversion" (i.e., the air becoming warmer instead of cooler with increasing height) results in the bending and ducting of VHF signals. Such conditions occur often in periods of fine warm anticyclonic weather.

A good "tropo" opening is regarded as bad news by broadcast engineers since it brings a big increase in the number of complaints of "patterning" on TV pictures caused by interference from distant stations on the same frequency; but the same conditions are welcomed by amateurs who find they can make contact with stations as much as four times farther away than in "normal" conditions.

Tropospheric ducting is not confined to VHF/UHF signals but can also enhance ground wave signals on frequencies between 20-30 MHz (and possibly sometimes even much lower frequencies).

At the other end of the frequency scale, at 10,000 MHz, sea-path ducting has enabled British amateurs to span the distance from Cornwall to Scotland using a few milliwatts. This was achieved in August 1976 but had an unexpected result: with an "over 500 km" record achieved, enthusiasm for further tests appears to have declined and the 10 GHz "record" has now passed to Italian amateurs who last year exceeded 600 km in the Mediterranean.

- Pat Hawker, in "Everday Electronics", April 1980.

BITS AND PIECES

LICENCE NUMBERS AT END OF 1980: Australian totals for amateur licences were: Full 6976; Limited 3782; Novice 4148; Total 14,906.

Licence numbers in New South Wales were:
Full 2398; Limited 1104; Novice 1304; Total 4786.

The Australian total for CB licences was 76,376 (which means there is better than one amateur licence for every five CB licences). The total number of licences for all radio services in Australia was 380,609.

QSL BUREAU ADDRESS CHANGE: It is understood from the W.I.A. Sunday news that the new address for the N.S.W. QSL Bureau is now:

P.O. Box 123,
St. Leonards. N.S.W. 2065.

EXTRA MORSE PRACTICE: Leading up to the May Amateur Examinations, an extra morse practice session will be provided on 3550 KHz, 6 a.m. to 7.30 a.m. local time, from Monday to Saturday. Speeds will be from 5 to 10 words per minute. Material will include 5-letter groups, 5-letter-and-figure groups, plain language, and random words. An additional session from 5 p.m. to 6.30 p.m. may be provided nearer the examination date. This service is being offered by the Coffs Harbour and District Amateur Radio Club.

AMATEUR TELEVISION: Meetings are being held on the third Tuesday of each month, at 7.30 p.m., at the Wireless Institute, 14 Atchison Street Crows Nest. Next meeting will be on the 19th of May.

A.N.A.R.T.S. GENERAL MEETING: June 5th at 14 Atchison Street. Well worth attending by teleprinter enthusiasts.

REPEATER RAMBLINGS: The repeater near Oberon, 6650 (Ch 1) is at present off air with a wind generator problem - it is hoped to have it back in service around mid-May. The Heathcote repeater, 6800 (Ch 4) is believed to have ceased operation when a cement truck inadvertently backed into the antenna tower and brought it down. With respect to the proposed move for the Wollongong repeater 6850 (Ch 5), it seems that political problems may prevent use of the intended site, so alternatives are presently being considered.

MORSE EXAMS: From "Amateur Radio" for April 1981, comes this information:

Candidates for morse exams are specially reminded that the morse sending or receiving of letters is not adequate in itself. There is a space of 7 dots between words and this has to be observed so that whatever is sent or written down should be in understandable composition English. Thus, to omit a space between two words is one error. Many errors could be recorded against you if, for example, in receiving morse, you write down a string of letters not separated into discrete words. This reminder is given to dispel any rumours to the contrary and to alert candidates to the official requirements.

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TEA-TIME: All though the night London police were combing the underworld for the three youths who escaped over the wall from Wormwood Scrubs jail, London.

Mrs. Johnson was picking blackberries on Wednesday afternoon when she saw a length of black rope thrown over. A wooden ladder followed, and three men dropped on to the grass in the lane which divides Mrs. Johnson's garden from the prison wall.

"I thought they were dodging out for a cup of tea, and intended to go back again," said Mrs. Johnson. "I did not bother to raise the alarm."

- Daily Express.

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ORNITHOLOGICAL OUTBURSTS

- Dave Henderson VK2VAV/YKQ.

When comparing the Amateur Service to the CBRS, one of our greatest differences used to be operating procedure. However, at a recent public demonstration of Amateur Radio, I made the mistake of allowing the unsuspecting public to listen to my 2m rig. First of all there appeared the "coax cockatoos" - two stations discussing cutting "resonant half-wavelengths of coax" and trimming their coax for best results - AHHHHR! Let it be known throughout the land:

1. If the antenna impedance equals the cable impedance which equals the output impedance of the transceiver, then the coax length will make no difference (except for a power loss in the cable).
2. If the transmission line is a multiple of half-wavelengths long then the impedance at the transceiver end of the cable will be exactly that of the load (the antenna), regardless of the characteristic impedance of the cable.
3. If the transmission line is an odd multiple of quarter-wavelengths long then the impedance at the transceiver end will be equal to the square of the line impedance, divided by the impedance of the load (antenna).

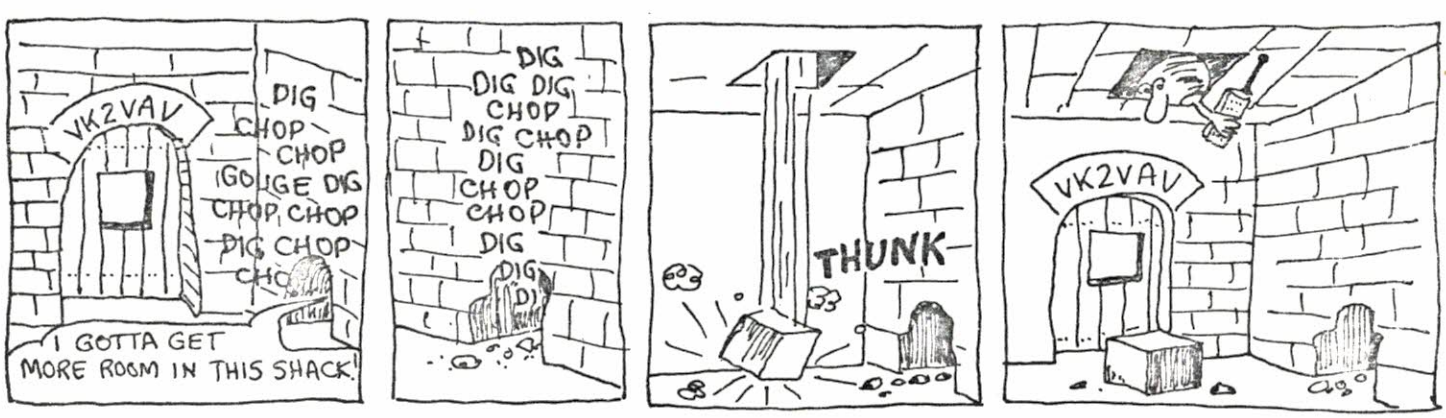
So I hope we don't hear any more of that issue.

Next up on the repeater was an "SWR galah" advising a new call to trim his quarter-wave resonant antenna to get his "swarrr" down to at least 1.2:1 - Yes this was on 144 MHz, not 27.

After the shock of that one, I was expecting anything. Well, I got it... a "twenty-metre turkey" dropped in and called a friend. His call contained his friend's call-sign not once, or twice, but TWENTY-ONE time! His own call was only repeated eighteen times. This action is totally unnecessary on a 2 metre FM repeater, it is also boring and ANNOYING!

We were then entertained counting the number of "there's" that an operator there was there saying there every third word there, and trying to figure out who else was with him, as he always said "we". He also was obsessed with call-signs, putting them at the beginning and end of every over, and more than once uttered "VK2DDD this is VK2EEE. OK George. VK2DDD, VK2EEE". For heaven's sake, read the handbook - page 30, 7.2(b) states that callsigns need only be mentioned: "...at the beginning and end of a series of transmissions between stations...not less frequently than once every 10 minutes".

This may be rather petty you think? Maybe, but after all quick, efficient and polite operation used to be one of the things that attracted people from the "Roger 10-4 there good-budgie" style of operation, and sloppy operating procedure is one of the easiest things for the public to pick up, and also the easiest for us to correct, so how about it?



IRISH CROSSWORD

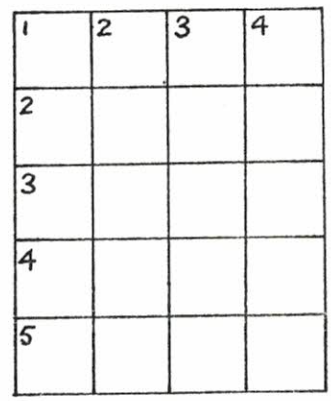
Try your hand at this crossword puzzle. The solution would normally be in next month's Propagator; however, to trick those people who cheat by waiting a month and then copying down the solution, we will publish the solution in this month's Propagator.

CLUES ACROSS

1. Vegetable
2. Sheep
3. Poultry
4. Oceans
5. Something often dropped

CLUES DOWN

1. Drink
2. Tool
3. Hit
4. ... and Judy



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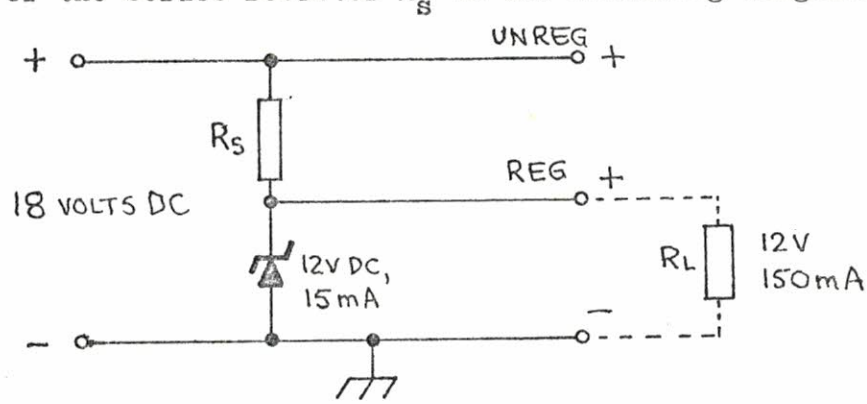
NEW SAMPLE AOCP EXAMINATION PAPER

Your attention is drawn to the new sample paper which appears in "Amateur Radio Action", Vol 3 1981 Number 12. Errors appear in questions 34, 35, and 46. The corrected questions are given below:

34. An 0.2 microfarad capacitor will have a reactance of 1000 ohms at the frequency of:
    (a) 800 Hz
    (b) 1 Hz
    (c) 1 MHz
    (d) 8 MHz

35. For a 1 volt range, a 50 microampere movement with an internal resistance of 2000 ohms needs a multiplier resistance of:
    (a) 1000 ohms
    (b) 3000 ohms
    (c) 18,000 ohms
    (d) 50,000 ohms

46. The value of the series resistor R_s in the following diagram should be:



    (a) 6 ohms $\frac{1}{2}$ watt
    (b) 6 ohms 1 watt
    (c) 36 ohms $\frac{1}{2}$ watt
    (d) 36 ohms 1 watt

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NEW CALLSIGN: Congratulations to Andrew, formerly VK2PHS, who has now got his new full call of VK2DVB. If Andy uses all the gear he has taken home from auctions, he should be well heard on all bands from 160 metres to 10 GHz!

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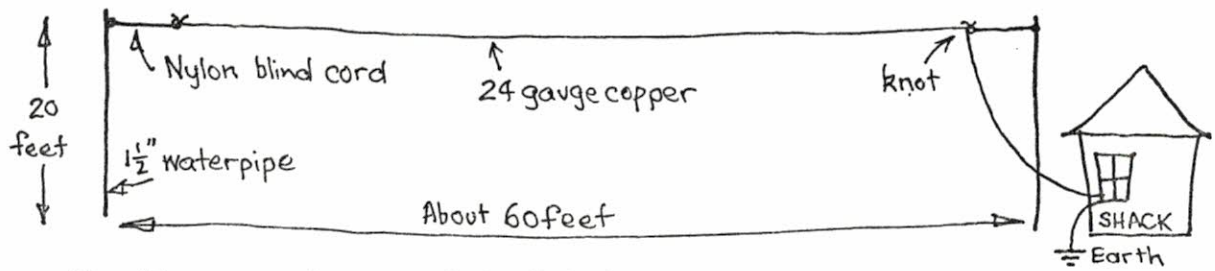
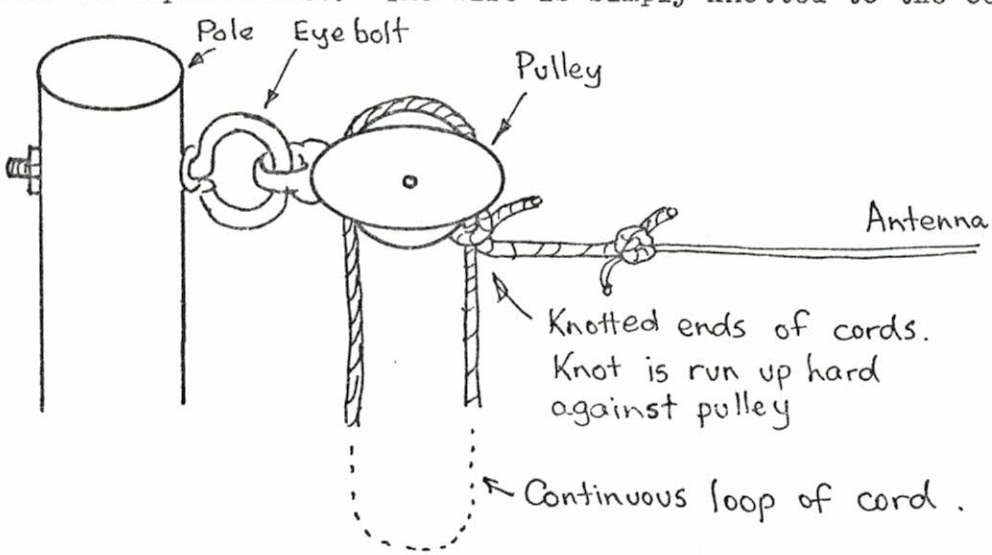
A CHEAP AND SIMPLE ANTENNA SYSTEM

- Brian Wade VK2AXI

A cheap and inconspicuous random wire antenna can be made using plain or enamelled copper wire of about 24 gauge.



The 24 gauge wire was intended for temporary use only, and it was expected that wind or birds would bring it down within a few days. However, it has now stayed up for over two years, and ridden out storms which have brought many local beams to their knees. The wire could not be pulled too tight or it would have broken, but because of its low weight there was very little droop. Tension on the wire is so low that the supporting poles do not need to be guyed. Support and insulation at the ends of the wire is provided by nylon blind cord or one of the other synthetic types of cord found in supermarkets. The wire is simply knotted to the cord at each end.



To simplify raising and lowering the wire, a continuous loop of cord is run through a pulley attached to the top of each pole. The piece of cord supporting the antenna is tied on at the knot in the continuous loop, making the combined knot too large to pass through the pulley block.

While the dimensions shown above have been found to work well, other dimensions should pose no problems. One of the advantages of a random wire antenna is that it can be made whatever size is needed to fit into the space available.

An antenna tuner is needed in order to resonate the antenna on each band, and to match the impedance found at the end of the wire to the 50 ohms or so required by most commercial transceivers. A suitable tuner is based on the design in Bill Orr's book "Wire Antennas".

The tuner coil was made of 32 turns of 22 gauge copper wound on a two-inch diameter plastic pipe. The turns were spaced to make the coil four inches long. Grooves were cut at $\frac{1}{8}$ inch intervals on one side of the pipe with a tenon saw and the wire was wound to fit in the grooves.

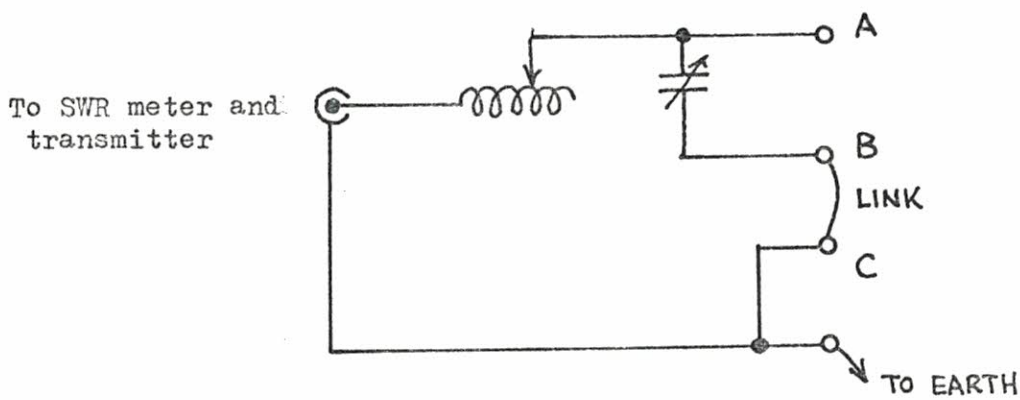
-continued next page...

A Cheap and Simple Antenna System - contd.

A trickle of araldite was used to secure the turns along one side of the plastic pipe. Short wire stubs were soldered to every second turn of the coil to provide taps which could be gripped by an alligator clip.

The capacitor was a two-gang variable salvaged from an old valve receiver. The two sections were paralleled to get about 900 pF maximum capacitance. An insulated shaft and knob are recommended.

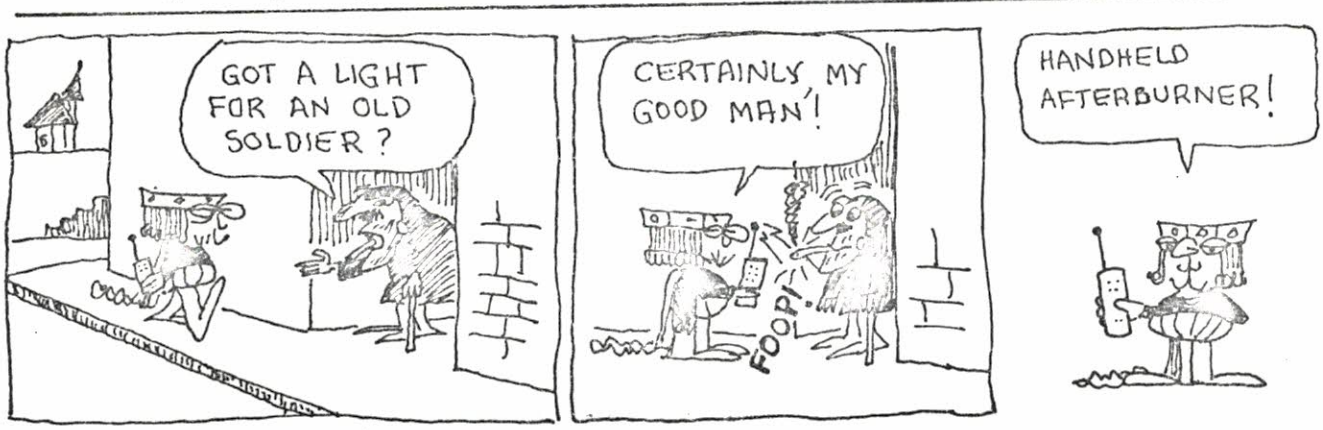
The ground wire was made as short as possible and the end was soldered to a large fruit tin buried in the garden. The soil must be kept moist to keep the SWR down. Ground wire length will probably be no problem on 80 and 40 metres. However, on the higher bands it can be a significant fraction of a wavelength. Try to avoid the situtation where it is a quarter of a wavelength long .



The end of the wire antenna is normally connected to terminal "A", while B and C are linked. For very short antennas, better results may be had by removing the link and connecting the antenna to "B".

To tune up, first tune the transmitter into a suitable dummy load. Then adjust the coil tap and capacitor to get minimum SWR on the coaxial line between the transmitter and the tuner. (Don't move the alligator clip when the transmitter is on!) Some trial and error will be needed to get the best settings for each band. Please do the initial adjustments at times when you will cause least disturbance to other band users - for example, it would be most inconsiderate to spend a long time making adjustments on 80 metres at night, when the band is open - and crowded with users.

This system was thrown up several years ago as a stop-gap way of getting onto 80 and 40 metres (although it also works on 20, 15 and 10 metres). It has worked so well on 80 and 40 that it hasn't seemed worthwhile to upgrade it. And there just doesn't seem to have been enough time to replace that lowly alligator clip with a rotary switch. Cost of the whole system, excluding the poles, would be about $5.



Don't photocopy this page!

The humble photocopier is the latest addition to the seemingly endless list of everyday items that may constitute health hazards. For research reported in the current issue of *Science* (29 August, p 1037) shows that impurities in "toners" —the "ink" of the photocopying process —cause mutations in the genetic material of bacteria.

That toners cause bacterial mutations was first noted by a group of Scandinavian researchers—Göran Löfroth and Edward Hefner of Stockholm University and Ingrid Alfheim and Mona Moller of the Central Institute for Industrial Research in Oslo. They put chemical extracts of "printed" sheets from a photocopying machine through the now famous Ames test to detect mutagens, which, scientists believe, must be considered putative cancer-causing chemicals, to err on the side of safety.

The Scandinavian researchers found that their extracts of photocopied sheets were indeed mutagens—as were extracts of the toners from several different makes of photocopier. Obviously, the mutagen was in the "ink", not the paper. Their next step was to identify the mutagen. They found that toners from different makes of photocopier had different mutagens in them. Clearly, the investigators were on the track of more than one chemical.

They cornered one culprit with liquid chromatography—which revealed that the mutagen in the Xerox toner had the same chromatographic peaks as did 1,6- and 1, 8-dinitropyrene, which are known to be mutagens. At this stage, another group of researchers, led by Herbert S. Rosenkranz of the New York Medical College in Valhalla and including scientists from Xerox, took up the search.

The American group cleverly combined the Ames test and liquid chromatography to track down the guilty chemical in the toners of Xerox's machines. Chromatography isolated and identified the suspects while the Ames test proved them guilty or innocent. Eventually the dynamic duo of techniques convicted nitropyrenes—impurities in the carbon black that colours the toners. □

"The name here is Frank and everything is homebrew."

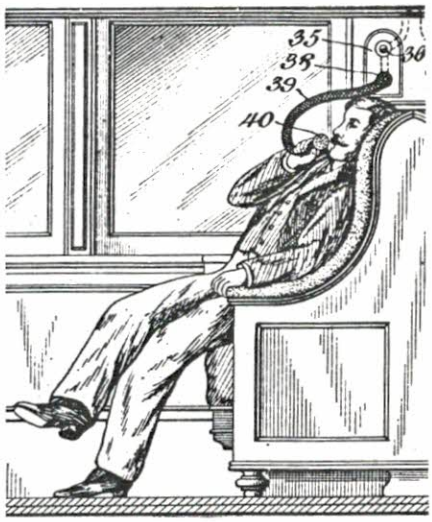
Pixilated Patents

By Mike Rivise

"To Air Is Human"

This is No. 125 in a series of odd and interesting inventions in the electrical/electronic field from the files of the US Patent Office.

Christopher Columbus made the comment while in the doldrums just off the Azores. "We are lacking air," he said. Since then man has repeated this statement on many occasions, as did a recent mountain climber while adjusting his oxygen valve. Science finally caught wind of this need to draft the invention shown in the illustration.



The relaxed man in the illustration is breathing fresh cinderless air while riding on a train. The euphoric expression on his face is produced by W. E. Symons' ventilating ssytem, patented in 1908 (No. 903,339). It would probably take a resident of Los Angeles or someone who has ridden on an 1908 train to fully appreciate the delightfulness of breathing fresh filtered air. However, one may partially comprehend the genius of the Symons' ventilator by considering the alternative in 1908. A man wants fresh air; he opens a window to let in air—and in comes a volume of dense smoke with cinders of assorted sizes as well. It is likely he will get a cinder in his eye and be unable to see the window to close it. When it is finally closed, the car will be gray with dust and suspended contamination. One instance such as this, of course, would be enough to cure any fresh air fiend or fan the imagination of an inventor like Symons.

From the passengers point of view, the ventilator is a breeze to operate. One simply inserts a hose (the porter has a supply of various lengths) into an oriface on the wall, a valve is switched on, and an electric fan blows air from the nozzle end. The passenger merely points the air where he wants it.

The reader can well imagine, however, that a simple device is not a foolproof one. The unlucky fellow who happened to attach his air hose to a water or electrical outlet would be likely to get his spirits dampened or receive a charge. Plugging in could be a problem. One who plugged in to the wrong place would be likely to let off a great deal of hot air and probably would consider Symons to be little more than a blowhard.

Still, as the saying does, it is an ill hose that blows only air. Other uses may be found. When seated next to a sweet young thing, one may gallantly ask if she "would like a little air." If there happens to be only one hose, two might share it. If there are two hoses, they may become entangled and entwined. There may be blushes, stirrings and gusts of incipient conversations, and even a full-blown romance.

IRISH CROSSWORD SOLUTION

ACROSS

1. P's (peas)
2. U's (ewes)
3. N's ('ens)
4. C's (seas)
5. H's

DOWN

1. Punch
2. Punch
3. Punch
4. Punch

1 P	2 P	3 P	4 P
2 U	U	U	U
3 N	N	N	N
4 C	C	C	C
5 H	H	H	H

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WICEN NET FREQUENCIES

	80 metres	40 metres	20 metres
Primary frequency:	3.600 MHz	7.050 MHz	14.100 MHz
Secondary CW :	3.575 MHz	7.025 MHz	14.075 MHz
Secondary Phone :	3.625 MHz	7.075 MHz	14.125 MHz

The two-metre simplex frequency is 145.7 MHz, and the two-metre repeater frequencies are 147.75 MHz in and 147.15 MHz out.

The WICEN net is held on 3.617 MHz, 9.30 p.m., Thursday nights.

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GENTLEMEN'S AGREEMENTS: The frequencies for CW only operation, and for CW and phone are given below. Notice that in Australia, these frequencies have been set and observed by the mutual cooperation of amateurs themselves. In the U.S.A., for example, CW and 'phone sub-bands are set by government regulation. This is one area in which the Australian amateur has greater freedom than his U.S. counterpart.

	C.W. ONLY	C.W. or PHONE
80 metres:	3.5 - 3.535 MHz	3.535 - 3.7 MHz
40 metres:	7.0 - 7.03 MHz	7.03 - 7.15 MHz
20 metres:	14.0 - 14.10 MHz	14.10 - 14.35 MHx
15 metres:	21.0 - 21.15 MHz	21.15 - 21.45 MHz
10 metres:	28.0 - 28.2 MHz	28.3 - 29.7 MHz

(Note that 28.2 - 28.3 is used for beacons).

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IMPORT RESTRICTION ON CB SETS: The Minister for communications, Mr. Ian Sinclair and the Minister for business and consumer affairs, Mr. John Moore, jointly announced the introduction of an import control on CB radios. The control is necessary the ministers said because certain types of CB radios which were not designed for Australian conditions were being imported and sold in Australia. These units cannot be operated legally and have been the cause of a great deal of interference to other radio services particularly television reception. The effect of the control, introduced through the customs (prohibited imports) regulations, is to prohibit the importation of 27 MHz CB radios which are able to transmit on any channel other than the 18 approved Australian channels in the 27 Megahertz frequency band.

- VK2TTY news, 19th April, 1981.

VK2TTY transmits every Sunday at 0030GMT on 7045KHz, 14090KHz, 14095 KHz, and 146.6 MHz. The broadcast is repeated at 0930GMT on 3545KMz and 146.6 MHz. The speed is 45.45 bauds and the shift is 170 Hz.

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SPACE TRAVEL PROBLEMS, OR WHY DID THE SHUTTLE HAVE SUCH BIG FUEL TANKS?

Travel in empty space:

The only way to obtain a thrust in a completely empty space is to use recoil forces like those acting on a gun when it fires a projectile. A rocket is much like a continuously firing gun that constantly sprays out "bullets" of exhaust gas obtained by burning fuel and oxygen together.

The highest speed which a rocket can reach depends on (1) the mass of fuel available to be burned; (2) the exhaust velocity of the burned fuel gases; and (3) the non-fuel mass, including the payload.

For rockets using chemical fuels such as petrol or kerosene, the theoretical maximum exhaust velocity is about 4.5 km/sec. In actual practice, many current rockets using kerosene and liquid osxygen obtain roughly 2.5 km/sec (even liquid hydrogen and liquid fluorine would be only 20% better).

Knowing the exhaust velocity limitation of chemically fuelled rockets, the mass of fuel needed to accelerate a rocket to any desired speed can be calculated. The figures are impressive, or depressing, depending on your point of view.

Artificial Satellites:

To place a satellite into orbit fairly close to the earth, it must be accelerated to a speed of 8 km/sec. A one-tonne payload would theoretically need 25 tonnes of fuel to reach such a speed.

Therefore, the 80-tonne space shuttle needs at least 80 x 25 or 2,000 tonnes of fuel - and hence very large fuel tanks!

In reality the situation is even worse - the "non-fuel structures" such as the rocket's casing, framework, fuel pumps and the like have much more mass than the final payload. In fact, with the best of modern structural materials and techniques, there is so far no rocket mechanism with a mass less than about 1/10 of the mass of the fuel it carries (rather than the 1/25 required). Such a rocket could not be put into orbit at all.

The way out of the problem is to use "staging", which amounts to putting a small rocket onto a larger rocket. Heavy casings and fuel tanks can then be thrown away as fuel is used up, and the remaining fuel is used more efficiently towards the end of the process.

Interplanetary Travel:

A vehicle travelling to another planet must leave earth with at least the "escape velocity" of 11.2 km/sec. Compared to the close orbital speed of 8 km/sec, this seems a quite moderate increase. However, the fuel-to-payload ratio increases so that 89 tonnes of fuel are needed to deliver one tonne of payload. That is, about $3\frac{1}{2}$ times more fuel is needed to reach a planet than to achieve close orbit.

The Mariner 4 probe to Mars, for example, actually required a takeoff mass 400 times as large as the mass of the probe itself. The rocket was an Atlas-Agena with an initial mass of about 200,000 pounds, and a payload of 500 pounds. It was designed to cover the 300 million mile trip in about 7 months (i.e., at about 16 miles per second).

Continued next page.....

Space Travel - contd.

Travel to a Star?

The nearest star, Proxima Centauri, is 4.2 light years from earth. If a payload is to travel this immense distance in 100 years, its average speed must be 12,600 km/sec. Assuming the use of chemical rockets twice as good as today's models, the mass of fuel needed to deliver a payload of one tonne is:

10^{1094} tonnes (i.e., 1 followed by 1094 zeros)!

To see how impossibly large this mass ratio is, the total number of atoms in the solar system has been extimated to be about 10^{58}. There could not be enough chemical fuel in the entire solar system to send even one atom on such a journey!

Of course, the fuel could be reduced by travelling more slowly. For example, if the journey took 5,000 years, the fuel needed for a one tonne payload would be 8×10^{21} tonnes. This is still absurdly large, because it is 30% greater than the mass of the entire earth.

There is only one sensible conclusion: Interstellar travel is impossible if chemical fuels are used for propulsion.

It would be nice to know what Buck Rogers uses in his two-seater interstellar runabout!

For further information, see "Space Travel: Problems of Physics and Engineering" in Project Physics Reader 5, Horwitz, 1972.

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SLOW-SCAN TV:

Richard VK2ZVX now has an Apple II computer - that makes a total of five local calls with this beast. Dave VK2YKQ has given Richard a copy of his Slow-Scan program, so expect to hear "unusual" sounds on the repeater soon!

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WANTED: One black-and-white old Polaroid camera for SSTV hard copy. Dave VK2VAV/YKQ.

FOR SALE: Kenwood TS-120-S good condition with mic $520.
Kenwood TS-520-S good condition with DC- DC converter and mic. $490.
Contact Mark Ryan VK2NTD Phone 742404.

~~FOR SALE: Linear amplifier for 20-15-10 metres. 400 watts PEP, with two 4CX250B tubes. $150.~~
~~Bill VK2DJ, phone 713569.~~

WANTED: DC-DC converter for TS520S. Contact Les VK2VTF/YVD. Will pay up to full new price.

WANTED: Inexpensive receivers capable of receiving the 80 metre morse practice sessions. Several students in the Novice Licence class with limited funds would appreciate assistance in this direction. Contact Brian Wade VK2AXI (phone 84 1381).

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