The real headline news for me this month isn't in RTTY at all, but lies in Karlson Associates. The January issue of Radio and Television News had an article by John Karlson in it giving engineering data and construction data on the Karlson Enclosure. The response has been cataclysmic. The requests for more information have been pouring in, with over fifty a day at times. Orders have been coming in from dealers all over the country, followed by re-orders, over $10000 in orders have been received in January. A second factory has been started to work so that we won't be too far behind in filling orders. The letters we get from customers would make an ad man's head swim in ecstasy; "...I'm motivated by an unrestrainable desire to tell you of my enthusiasm over your new discovery in speaker cabinets," just to give you a brief sample.

For the first two weeks in February I shall be in L.A. to put on an exhibit of the Karlson Enclosure at the Audio Fair. While there I will be visiting W6LLP and hope to meet all of the L.A. TTIers. I'll be down in Washington for another Audio Show during the first week in March.

WØHZN, Bruce Meyer, "It is quite true that activity here in Minneapolis/St. Paul has been rather spotty. We are trying to consolidate our forces here somewhat in order to group those who are really serious about Ham Teletype. We are shooting for an active organization which will show more spirit. Our mailing list of Twin Cities addicts now contains twenty-eight names, some of which belong to non-amateurs who have joined the group as technical advisors. Members of the telephone and telegraph companies can and do willingly provide a lot of help when we run into machine troubles. Only a fifth of the group on the roster of the interested is active on the air with RTTY. Forty meters has been more popular than eighty, probably because of the ease of crystal frequency shifting at the higher frequencies. The organizer of our group, Boyd Phelps, WØBP, has been forced to postpone operation with RTTY because of an engineering commitment in Rockford, Illinois, where he is engineering the construction of AM station WRBB. We expect him back on the ham bands in a month or two.

Our low activity index here is probably the direct result of having a very loose organization. If we had a "hot" two-
meter net here things might be stirring on the lower frequency bands also. It is hoped that within the next year we may connect the Minneapolis/St. Paul area by RTTY VHF link with the Milwaukee and Chicago amateurs. There are enough intermediate 144 mc stations now to make this a reality. We'd like to hear from interested RTTY lads in Wisconsin.

Some of us, myself included, are much too busy building and rebuilding RTTY converters to be able to stay on the air for more than two successive G30's. Maybe this isn't a good thing from the standpoint of representing the RTTY'ers on the ham bands, but I, for one, am convinced that it leading to better and better equipment. Along that line I would like to encourage every technical enthusiast to pose questions for others to answer either directly or via the medium of Amateur Radio Frontiers.

I have tried to evaluate the Northern Radio Model 152 converter by "breadboarding" it and trying it out with copy off the air fed to my Model 12 printer. It was my experience that the major virtue of the 152 converter is its relative immunity to the effects of frequency drift. Signal bias and distorting are thereby minimized, but at the expense of selectivity. The basic idea of using a phase-sensitive detector to replace frequency-selective detector circuits is very attractive. After all, frequency is the time-derivative of phase, and all we gain by using frequency selection is an averaging effect which may be obtained by other, simpler methods. The major shortcoming that I found in my mockup of the 152 converter was a tendency for the flip-flop following the phase detector to "hang-up" when an extraneous audio tone near the crossover frequency was strong enough to be recognized. The flip-flop would stay on the marking side or the spacing side until the unwanted tone would fade down into the "mud". In the presence of static crashes or pulse-type noise of a few milliseconds duration, the flip-flop would either hang-up or oscillate between the marking and spacing conditions in a somewhat uninformative manner. In all fairness to the Northern Radio 152 converter it should be stated that my experimental model did not duplicate the parts and tolerances of the commercial model and it seems quite reasonable to assume that the performance of the commercial model would be better than that of my own version.

Several people who have attempted construction of the 152 circuit have experienced trouble in getting an 850 cps shift with a sharp crossover at 2550 cps. My guess is that the 152 was never intended for a greater shift than 170 cps. Special measures can be taken to improve the shift characteristic. One solution which works quite well is the use of two tuned phase-shift circuits staggered above and below the crossover frequency, and connected in series with the plate circuit. This practice tends to nullify the otherwise good drift characteristics of the converter, however.

Operator techniques in tuning the receiver are quite important too. It is a waste of time to hook up a good converter to a lousy receiver or an improperly adjusted receiver. The audio spectrum of the receiver should be fairly flat within the range of 1500-3500 cps. If it is not flat, noise will be distributed unequally between the marking-signal area and the spacing-signal area, and the result will be

(WØHZR's letter continued on page 7...)
ACUSTOMED TO THE GLASS AND GLITTER OF ELECTRONIC EQUIPMENT, IT IS
SOMETHING OF A SHOCK TO AN AMATEUR TO BE CONFRONTED WITH A METAL MON-
STER SATURATED WITH OIL TO WHICH A GENEROUS QUANTITY OF DUST AND GRIME
HAS ADHERED. ABOUT FIFTY PERCENT OF ALL PRINTERS RELEASED TO AMATEURS
WILL BE FOUND IMMACULATELY CLEAN AND SPARKLING, ABOUT HALF OF THE REMAIN-
DER WILL NEED JUST A CAREFUL WIPING AND THE BALANCE ARE REALLY FILthy.

THERE SEEMS TO BE A PROVERB, FREQUENTLY QUOTED BY COMMERCIAL TELE-
TYPE REPAIRMEN, TO THE EFFECT THAT THERE IS LITTLE TO GO WRONG WITH ONE
OF THESE CONTRAPCTIONS THAT A GENEROUS DOSE OF OIL WILL NOT CORRECT.
APPEARENTLY THERE EXISTS NO ADAGE TO COVER THE CLEANLINESS OF THE SAME
MACHINES.

AFTER A PERIOD OF SEVERAL YEARS THE WIRE COMPANIES PERFORM A DRAS-
TIC OVERHAUL ON THE PRINTERS BY TEARING THEM APART DOWN TO THE LAST
NUT AND BOLT AND LOCK-WASHER, CLEANING THE PARTS IN "GUNK" AND REASSEM-
BLING. THE MACHINES ARE SUFFICIENTLY COMPLEX THAT SUCH A JOB REPRE-
SENTS A MAN’S LABOR FOR A WEEK OR TEN DAYS. MOST TELTYPE ADJUSTMENTS
ARE RELATED ONES, THAT IS, THEY HAVE TO BE PERFORMED IN A CERTAIN SE-
QUENCE. IT IS INADVISABLE FOR AN AMATEUR TO ATTEMPT A SIMILAR JOB
UNLESS HE HAS THE MANUAL AND LOTS AND LOTS OF TIME. WITH THE LIGHT
SERVICE (COMPARED TO COMMERCIAL 24-HOUR-PER-DAY DUTY) AMATEURS WILL
REQUIRE FROM THEIR PRINTERS A VERY SATISFACTORY CLEANUP CAN BE PERFORMED
IN TWO HOURS, WHICH WILL MAKE THEIR PRINTERS GLASS, BY FOLLOWING
THE ROUTINE TO BE OUTLINED. WHILE THIS IS DIRECTED AT THE MODFL 12
PRINTER, WHICH PREDOMINATES BY A LARGE MARGIN, SIMILAR JOBS CAN BE
DONE ON THE OTHER MODELS OF PRINTERS SECURED THROUGH THE V.H.F.
TELETYPETE SOCIETY.

FREE LOAN OF TECHNICAL MANUALS

A SET OF MANUALS IS AVAILABLE FOR EVERY MODEL OF PRINTER. A
SET CONSISTS OF A MANUAL DESCRIBING THE FUNCTIONING OF THE MACHINE;
ANOTHER DESCRIBES THE ADJUSTMENTS AND A THIRD LISTS, BY NUMBER AND
NAME, THE COMPONENT PARTS. MANUALS CAN BE BORROWED FROM VHF TELTYPE
SOCIETY FOR A TWO-WEEK PERIOD (WHICH MAY BE EXTENDED IF OTHERS ARE NOT
WAITING) WITHOUT CHARGE EXCEPT THAT FOR MAILING. A DEPOSIT OF $4.
IS REQUIRED TO INSURE THE SAFE RETURN HOWEVER. REQUESTS FOR LOAN
OF MANUALS SHOULD BE MADE TO W2BFD AND DEPOSITS MADE PAYABLE TO J.E.
WILLIAMS.

REMOVING THE TOP

TAKE OUT THE FOUR FILISTER-HEAD SCREWS IN THE TOP PLATE FOUND
DIRECTLY OVER THE CORNER POSTS. IT WILL BE NECESSARY TO MOVE THE
CARRIAGE LEFT OR RIGHT TO GET AT THE REAR TWO SCREWS. LIFT UP THE
TOP PLATE; IT IS AS SIMPLE AS THAT!

CLEANING THE BASE

IF THE MACHINE IS ONLY MODERATELY DIRTY IT MAY BE POSSIBLE TO DO
A SATISFACTORY JOB BY MERELY BRUSHING OUT THE OIL-SOAKED DIRT WITH A
1-INCH WIDE PAINT BRUSH AND THE GENEROUS USE OF A WIPING CLOTH. TO
DO A GOOD CLEANING JOB, A LARGE BUCKET THAT WILL ACCEPT THE PRINTER
(FIVE-GALLON OIL CAN WITH TOP CUT OFF?) SHOULD BE OBTAINED AND THE
PRINTER PLACED IN IT, STANDING ON ITS RIGHT SIDE. INTO THE BUCKET
SHOULD BE POURED SUFFICIENT CLEANING FLUID TO FILL IT UP TO, BUT NOT
PAST, THE LEFT SIDE POSTS OF THE BASE UNIT. THE MOTOR AND THE
SELECTOR MAGNETS SHOULD BE PROTECTED FROM THE LIQUID. THE CLEANING
FLUID MAY BE KEROSENE BUT A MUCH SUPERIOR CLEANSING AGENT IS THE CHEM-
ICAL KNOWN AS "GUNK" USED BY TYPEWRITER MEN AND AUTO-MECHANICS WHICH
WILL REMOVE HARDENED DEPOSITS AND GUMMY OIL RESIDUE. THE "GUNK" IS
USED IN SOLUTION WITH KEROSENE.
THE BASE UNIT SHOULD BE ALLOWED TO REMAIN AWHIILE IN THE FLUID AND THEN REMOVED ONTO A METAL TRAY OR, AT LEAST, A PIECE OF OILCLOTH. STILL STANDING ON ITS RIGHT SIDE, IT SHOULD BE BRUSHED THOROUGHLY WITH A PAINT BRUSH TO REMOVE ANY PARTICLES REMAINING. A SECOND BATH MAY BE REQUIRED IN STUBBORN CASES.

THE TYPE SHOULD NOW BE CLEANED, USING ANY ONE OF THE VARIOUS PRODUCTS ON SALE FOR THAT PURPOSE IN TYPEWRITER STORES. IN A PINCH CARBON TETRACHLORIDE WILL DO, AIDED BY A NEEDLE TO PICK OUT ANY PARTICLES FILLING IN THE LETTERS.

THE LEFT SIDE OF THE PRINTER WHERE THE MOTOR AND MAGNETS ARE LOCATED WILL HAVE TO BE CLEANED WITHOUT IMMERSION BECAUSE OF THE DAMAGE THAT WOULD RESULT TO THE INSULATION.

WHEN THE BASE UNIT HAS BEEN THOROUGHLY DRAINED OF THE CLEANING FLUID AND HAS BEEN DRIED IT SHOULD BE LUBRICATED CAREFULLY.

LUBRICATION OF THE BASE

INTO EVERY ONE OF THE NUMEROUS OIL FILLERS SHOULD BE SPATIATED SEVERAL DROPS OF MACHINERY OIL. THIS OIL SHOULD HAVE A VISCOSITY EQUAL TO ABOUT S.-A.E. 20 AUTOMOTIVE OIL ALTHOUGH, BECAUSE OF THEIR USE OF DETERGENTS, AUTOMOTIVE OIL IS NOT THE MOST DESIRABLE. DO NOT USE LIGHT SEWING-MACHINE OIL SUCH AS 3-IN-1, WHICH IS SATISFACTORY FOR TYPEWRITERS BUT NOT FOR THE HEAVY DUTY PRINTERS. A SATISFACTORY MACHINERY OIL IS SOLD BY SEARS-ROEBUCKS AND MONTGOMERY-WARD. IN ADDITION TO THE OIL-CUPS A SINGLE DROP OF OIL SHOULD BE PLACED AT EVERY OIL-HOLE DRILLED IN A BEARING FOR THAT PURPOSE AND A DROP AT EVERY POINT WHERE NO SPECIAL OILING PROVISION IS MADE BUT WHERE PARTS TURN OR SLIDE. DO NOT USE EXCESSIVE OIL AS THE HEAT OF THE MACHINE WILL VAPORIZE THE OIL AND A FINE MIST OF IT WILL PENTRABE THE ENTRANCE PRINTER. TOO MUCH OIL WILL TEND TO ACT AS A DUST COLLECTOR. DO NOT OIL THE UPPER PIVOTS ON THE TYPEBAR LINKAGE. PROTECT THE TYPE FROM OIL. MAKE SURE THAT THE SELECTOR MAGNET PUMPERS (VISIBLE BY INVERTING MACHINE) HAVE A DROP OF OIL EACH. PLACE A FINGERFUL OF LIGHT AUTOMOTIVE CUP GREASE ON THE LARGE FLAT GEARED BY THE MOTOR PINION AND ROTATE HANDWHEEL SLOWLY TO DISTRIBUTE IT IN THE TEETH. WIPE OFF EXCESS. DO NOT NEGLECT TO LUBRICATE THE MOTOR BUT, AGAIN, DO NOT FLOOD IT. THEN STAND THE PRINTER BASE ON ITS RIGHT SIDE AND REMOVE THE HEXAGONAL CAP NUT ON THE END OF THE MAIN SHAFT. IT WILL DISCLOS THAT THE SHAFT IS OILY AND A FEW DROPS OF OIL SHOULD BE RUN IN. THIS OIL IS CONDUCTED TO THE INSIDE OF THE BEARING SURFACES BY TINY HOLDS DRILLED RADIIALLY IN THE SHAFT AT APPROPRIATE POINTS. WHEN THE MACHINES WERE NEW THEY CONTAINED OIL WICKS (LIKE PEPP CLEANERS) WHICH TENDED TO HOLD THE OIL IN THE SHAFT AND RELEASE IT SLOWLY.

CLEANING THE TOP - REMOVING THE CARRIAGE

WHILE THE CARRIAGE IS OFF, THE ROLLERS UNDER THE PLATEN AND THE PLATEN CYLINDER ITSELF SHOULD BE EXAMINED FOR HARDNESS (OR FLATTENING). HARD CYLINDERS MAKE THE PRINTERS NOISY, TEND TO ALLOW PAPER TO SLIP BUT, WORST OF ALL, TEND TO DAMAGE THE TYPE WHICH WILL LAST ALMOST FOREVER WITH SOFT RUBBER PLATENS. IF THE RUBBER IS IN POOR CONDITION IT CAN BE REPLACED BY ANY TYPEWRITER COMPANY FOR ABOUT $5. BUT IT IS MUCH CHEAPER TO SEND THEM TO AMES TYPEWRITER SUPPLY COMPANY AT 37 MURRAY STREET, NEW YORK, OR AT 564 WEST RANDOLPH ST., CHICAGO, OR TO 583 MARKET ST., SAN FRANCISCO. THEIR LATEST CHARGE FOR RECOVERING THE CYLINDERS WITH NEW LIVY RUBBER IS $1.35. HAVE THE SMALL PRESSURE ROLLERS DONE AT THE SAME TIME. AFTER REPLACING THE RUBBER A HABIT SHOULD BE FORMED OF WIPING THE ENTIRE SURFACE OF THE CYLINDER WITH DENTURED WOOD ALCOHOL WHICH WILL KEEP IT LIVY AND FRESH. DO NOT USE TOO MUCH ALCOHOL OR THE RUBBER WILL BECOME TACKY. ALCOHOL WILL NOT WORK ONCE THE RUBBER HAS HARDENED. IT WILL BE FOUND EASIER TO REMOVE THE ROLLER FROM THE RIGHT SIDE OF THE CARRIAGE THAN THE LEFT. BE SURE TO REMOVE THE BRONZE ROLLER-CYLINDER BEARINGS BEFORE sending it away for recovering.

THERE IS VERY LITTLE TO CLEAN ON THE TOP PLATE BUT IT CAN BE IMMERSED IN THE CLEANING FLUID AND CAREFULLY BRUSHED OFF AND RELUBRICATED. BE CAREFUL NOT TO LOSE THE SMALL SPRING RESTORING THE CARRIAGE-RETURN LINK (LOCATED TO THE REAR OF THE PNEUMATIC BUFFER-CYLINDER).

REPLACING TOP PLATE


REPLACING THE CARRIAGE


KEEP EM PRINTING

INEXPENSIVE DISTRIBUTOR "FACE-PLATE" FOR TELETEYPE TAPE TRANSMITTER-DISTRIBUTORS.

UNLIKE MORSE TELEGRAPHY, TELETEYPE SIGNALS CONSIST OF EQUAL-LENGTH IMPULSES. THUS AT THE BEGINNING OF ONE OF THE PULSES A "DECISION" IS MADE WHETHER IT WILL BE A MARK OR A SPACE. THE DECISION DOES NOT HAVE TO CONSIDER THE LENGTH OF THE IMPULSE WHICH REMAINS FIXED AT 22 MILLISECONDS. THE DECISION IS FIXED ON PAPER BY THE PERFORATION OF A HOLE (OR THE FAILURE TO PERFORATE A HOLE) IN THE TAPE. IF THE HOLE EXISTS THE INTERVAL HAS BEEN DECIDED TO BE "MARKING". IF THE HOLE IS NOT PERFORATED IT HAS BEEN DECIDED TO MAKE THAT PARTICULAR PULSE "SPACING".
There is no change in the "sense" (that is: whether marking or spacing) after the start of the 22 millisecond period. This being so, there is no real reason that the distributor requires segments on its faceplate representing the full 22 milliseconds of time at the angular velocity of the wiping brushes. All that is required is a brief "sampling" interval at the beginning of the 22 millisecond interval and a means of locking the output circuit in whichever "sense" the sample indicates.

A practical method of doing this would call for the five sets of tape sensing single-pole, double-throw contacts to be connected so their spacing contacts connected to a source of positive battery and their marking contacts to a source of negative battery (with opposite battery terminals grounded). The five moving contacts therefore feed polarized voltages to the faceplate.

The faceplate consists of a disc of bakelite or other insulation on which the "segments" have been laid out with a protractor, allowing 48-1/2 degrees for six of the segments and 69 degrees for the "stop" segment. At the leading edge of where the arc of the segment would lie a small hole is drilled to accept a small rivet or brass screw. These rivets or screws are connected on the reverse side with the five moving "tongues" of the tape transmitter and thus the rivets have either a positive or negative voltage at all times.

As the brush wipes around the distributor face it will momentarily strike the rivets and a short "pip" of voltage of one polarity or another, will occur at each rivet-head. The problem now becomes one of stretching the "pip" to full 22 millisecond baud-length. The simplest way to do this is to employ a polarized relay which has been adjusted so that it does not center but, rather, will lay on either the marking or spacing side when impelled there. The relay winding is connected between the distributor brush and ground. The short "pip" will move the relay to one side or another and it will stay on that side until the brush strikes another rivet-head which has the opposite polarity.

A better scheme would be to employ a twin-triode Eccles-Jordan flip-flop or bi-stable multivibrator. With this device the "pip" can be as short as a few micro-seconds and of negligible current yet control a sizeable current in the plate circuit. Moreover this permits the option of using a polar relay in the flip-flop plate circuit or utilizing an electronic method of keying the output.

By a little head-scratching it will be seen that the circuit can be arranged wherein the brush is grounded; this would permit a simple non-insulated drive mechanism for the brush. The simplest clutch would consist of a shaft with a collar about an inch from one end either soldered or otherwise fastened to it. On the short shaft end of this collar is placed a felt washer, then the brush-arm which can be cut from a tin (tomato) can. Then another felt washer, a metal washer (not fastened to the shaft) a spring and another collar attached to the shaft with a setscrew so that the collar can be moved in or out. This will permit clutch tension to be adjusted. The shaft can be rotated at 368 rpm by any means but a possibility exists that it could be driven by a standard cheap phonograph motor by fastening a disc to the shaft and, through a rubber "idler" wheel, driving that with the shaft of the phon-motor. The disc diameter would determine the speed ratio. (Ratio of shaft diameter to disc diameter, the idler is not considered). Another motor possibility is the old type phonograph motor, still available second-hand, having a mechanical friction-type fly-ball governor. The governor can be adjusted to the precise speed. If it was good enough to control the pitch of music it should be excellent for teletype. The disc diameter, in this case, should be chosen to make the motor run faster than it did for phonograph purposes because the stability of the speed control is greater at higher speeds.
that more "holes" will be punched in the marks than in the spaces, or vice-versa. This can lead to severe baud distortion. Heavy limiting or clipping of the receiver audio is not necessarily a good thing either. While it tends to reduce the heavy static crashes, it also tends to destroy a favorable signal-to-noise ratio. Light clipping of the large peaks can be helpful because it prevents paralysis of the receiver audio and shock-excitation of the filters in the converter.

If the operator tries to reduce the noise by using too narrow an IF bandwidth he may quite unknowingly hack off sideband energy he needs for undistorted copy. It is true that a narrow bandwidth reduces noise modulation of the signal, but the printer demands a wide bandwidth for undistorted copy. A band 1200 cps wide is about right for "high-fidelity" 60 wpm RTTY when using an 850 cps shift. A good rule-of-thumb is to add a minimum of 66 cps to the shift, or a maximum of 330 cps. Between these limits lies good copy.

In spite of the many assertions I have heard to the effect that the Northern Radio 152 was about the ultimate in converter design, it appears to me that it is not well-adapted to Amateur use. The original W2BFD converter is quite superior in its ability to extract intelligence from really "dirty" signals, at least as far as I have been able to determine from my experiments.

I have just embarked on a project to try to combine the circuit simplicity of the 152, and its drift-immunity, with the excellent rejection characteristics of the W2BFD converter. The heart of the new converter is a phase-detector utilizing the leading-lagging principle of the 152, but without the pulse techniques involving bistable circuits. It is felt that the sharp switching of the flip-flop with its memory for the last stimulus received is inferior to an integrating filter. The sensing of frequency is done by an R-C-L series-tuned circuit with a high-Q coil used in such a manner as to generate a "notch" by series-resonance at 2550 cps. This notch characteristic can be put to use in rejecting an interfering signal tone lying between the marking tone frequency and the spacing tone frequency. It is only necessary to tune the receiver BFO until the unwanted signal drops into the notch. Of course it can only be held there if both the signal source and the receiver are frequency-stable.

Some of the ideas for this converter were gotten as the result of reading an article by Robert M. Sprague in the November 1944 Electronics. The new converter employs phasedetection rather than frequency-discrimination, however. The article is good reading and ought to be of interest to all RTTY'ers who build their own equipment.

Preliminary tests of a receiving converter using this single tuned-circuit are very promising and show both good rejection of unwanted signals and noise immunity, together with an excellent freedom from bias caused by frequency drift. The receiver can be turned on cold and never drift enough in 15 minutes to destroy strong-signal copy. This characteristic is in sharp contrast with that of the last converter built here where narrow-band filters were used, centered on the marking and spacing tones. It was necessary to readjust the receiver tuning two or three times a minute during warmup when frequency selective circuits were used.
FORM 3547 REQUESTED

Following is a circuit showing the phase-detector used in the new converter. Naturally there is a lot more to the entire converter circuit, but that has been published and will not be shown here. The WØHZR converter has a single-ended output which may either drive a polar relay or work directly into the vacuum-tube keyer employed with the Model 12. ARTT 4056, WØHZR phase detector.

![Circuit Diagram]

Adjust R to just prevent signal peaking at L-C junction at 2550 cps.

It may be noted that the signal extracted from the junction of the capacitor and inductor is relatively constant over the frequency range 2000-3100 cps, whereas the L-C combination series-resonates at 2550 cps in the manner of a wave-trap to form a notch at this frequency, effectively short-circuiting this voltage. The remaining signal voltage at the L-C junction produces not net DC output in the detector. This is the effect which makes it possible to reject the signal near the notch frequency and makes the detector insensitive to interfering signals near crossover. The phase shift at 2550 cps is 90°, less at 2975 and more at 2125, causing discriminator output to vary.

Ray Morrison, W9GRW, ran into a nice deal for RTTY'ers in the form of surplus bandpass filters at $8.00 each, available from Radio Surplus Corp., 732 So. Sherman, Chicago, or from Capitol Commodities Corp., Chicago. Range: 1700 cps to 3300 cps and 600 ohms characteristic impedance, in and out. I am using one...it works nicely."