

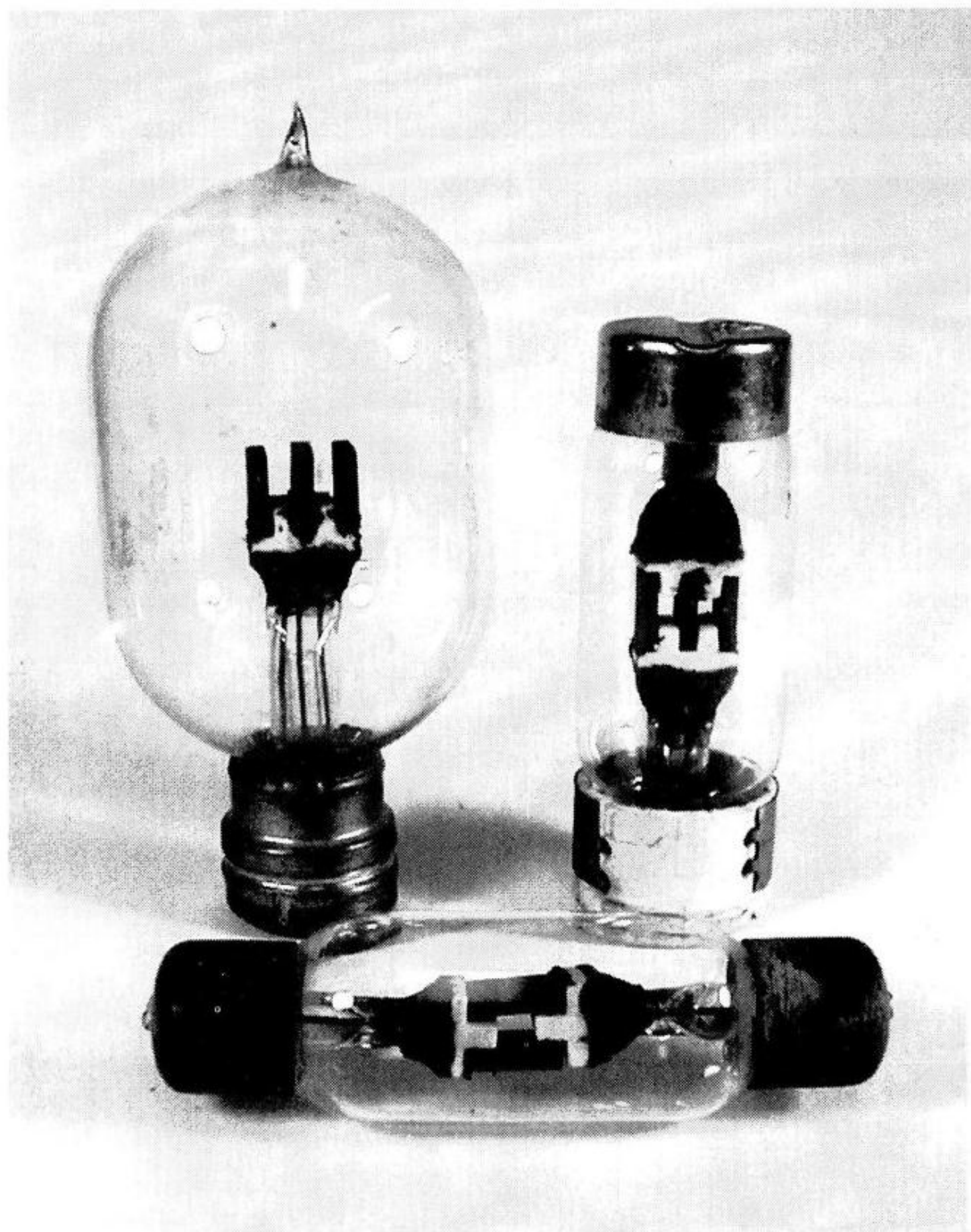
TUBE COLLECTOR

TUBE COLLECTORS ASSOCIATION

"From Fleming to Fetrons"

Vol. 5, No. 1

February, 2003



THE "VAC-M" LIGHTNING ARRESTER

Ludwell Sibley

The front cover shows three telephone surge protectors sold under the "VAC-M" brand in roughly 1916-25. These were products of the National Electric Specialty Co. of 314 S. St. Clair St., Toledo, Ohio. They and their relatives may show up as "mystery tubes" in collections.

The vertical brass-based / tipped tube on the left is a three-electrode design, 2-½" in diameter and 5-½" high overall. At right is another, earlier, three-element type. Lying horizontally is a two-electrode unit.

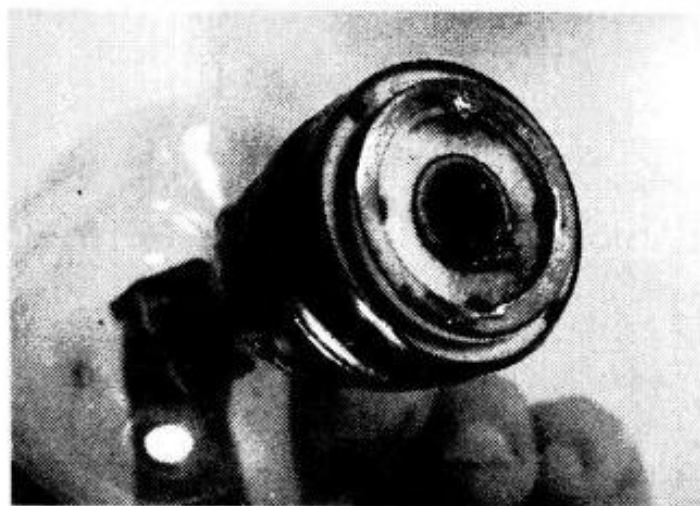
The bulbs of all three are stamped, in smudged ink, VAC-M LIGHTNING ARRESTER / TRADE MARK REG. 5-5-14 (?) / PAT U. S. A. 8-6-12 / (DATE) 2-22-16 (?) / THE NAT'L ELECTRICAL SPECIALTY CO. / TOLEDO OHIO U. S. A. The type is tiny, about 7-point size, and easy to overlook or wipe off.

The VAC-M units all use what look like blocks of graphite for their elements, sealed to ceramic holders with dark gray refractory cement. (Do we see here the first *carbon-anode* tube?) They all have copper-colored leadout wires, probably of Dumet material, through the seal presses. The wire is of about 19 gauge, heavy compared to radio-tube leads.

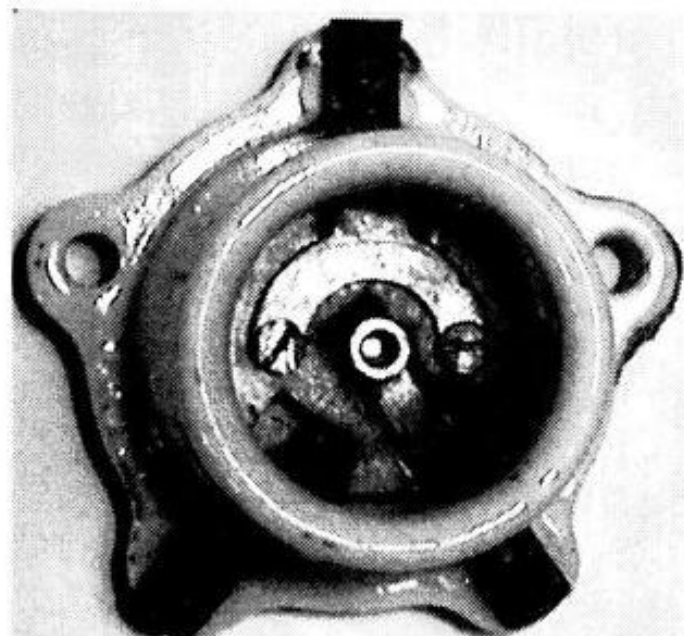
The tubular dual-electrode unit on the right (their "No. 3") slips into a three-clip porcelain mounting. The single-element protector fits a pair of 60-amp fuse clips.

The larger three-element VAC-M has a unique screw-in base. It is an internal-thread design like that on Thomson-Houston incandescent lamps - the center of the base has a female thread. However, the thread is a big 5/16-18 (5/16" nominal diameter, 18 threads per inch). The outer base shell carries the ground electrode, while the line electrodes connect to the threaded part and to an intermediate ring on the bottom of the base.

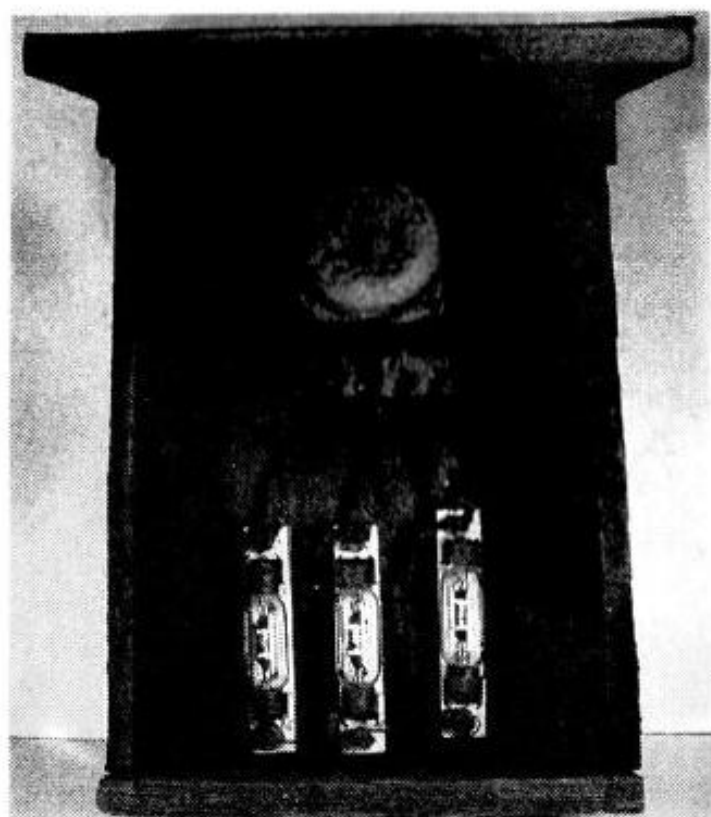
The corresponding porcelain socket is also unique. It carries molded-in designations LINE, LINE, and GROUND, but no further identification. In installing the tube, after the bulb is screwed-in, a



VAC-M internal-thread base.



Special socket, with stud in center.



Repeat coil, VAC-M protected.

setscrew on the side of the socket is to be turned in to lock the shell and assure a firm ground contact.

The first VAC-M advertisement found (see rear cover) was from *Telephony* magazine from 1916, but that was probably not their first appearance. (The search for ads was limited by lack of a long run of copies of the journal).

Advertised later was another three-electrode VAC-M: a tubular bulb with end caps and a ring at mid-body for the ground electrode (again, see rear cover).

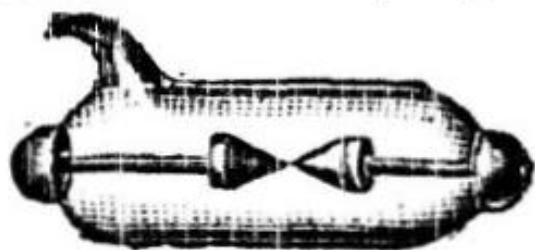
By 1923, a "VAC-M Container," presumably a weathertight outdoor mounting, was offered for use with the arresters.

The last VAC-M ad noted was from mid-1925, although the 1928 *Telephony* industry directory still listed them. Additionally, VAC-M arresters were offered for radio-antenna use [1].

On the previous page is a photo of a small wooden box that was mounted on a rural telephone pole, long ago. It contains a repeating coil (WE 47A) that joined a two-wire magneto phone line to a one-wire-and-ground extension. The coil is protected with three VAC-M arresters. The coil is the round object at the top; the protectors are at bottom.

OTHER VACUUM PROTECTORS

Vacuum lightning protectors were used quite early by the British Post Office on its telegraph lines [2]. The English design consisted of a short glass tube with seal-off tubulation. It contained a pair of conical metal electrodes with points facing each other, each sealed into an end of the bulb. The tube was evacuated to a low air pressure. The protector was described as highly "efficient," but prone to be destroyed by the surges that it was stopping and therefore requiring monthly



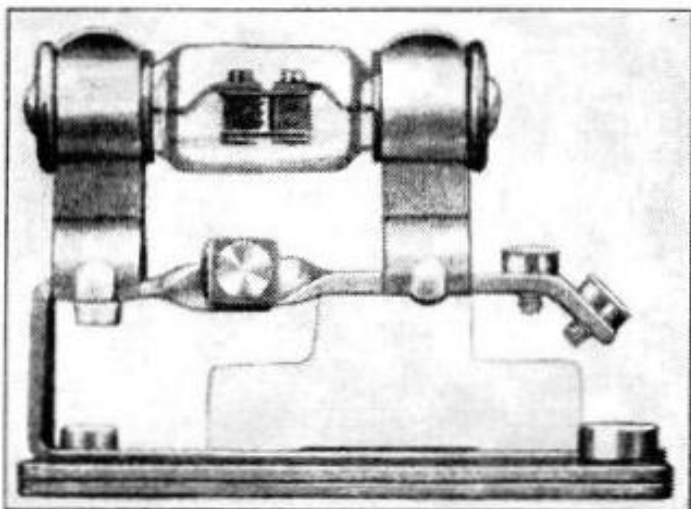
British design, ca. 1906 [2].

testing. This was a cold-cathode diode vacuum tube in commercial service, contemporaneous with the Fleming Valve!


Vacuum protectors came into American use in the Teens. A 1913 telegraph textbook [3] shows such a protector, although the illustration suggests it may have been of foreign manufacture. The L. S. Brach Company of Newark, NJ was selling a unit quite like the two-element VAC-M protector in 1914 [4].

Three-electrode vacuum (or gas) protectors are quite effective in protecting two-wire telephone lines. With both line electrodes in the same atmosphere, a lightning surge will ionize both gaps simultaneously. By contrast, with separate two-electrode protectors, one unit may fire a microsecond or so ahead of the other. Most of the surge energy is traveling along the common-mode path (both wires to ground). When one protector fires before the other, grounding its own wire, the common-mode surge is converted briefly to a wire-to-wire surge, which is likely to be more destructive to the connected equipment. This applies to the VAC-M design and the later gas-filled protectors used in modern times on particularly important circuits.

The Brach company stayed in competition with VAC-M. By 1925 it was offering a three-electrode cartridge-type protector, available with either "vacuum" or neon fill. The 1926-27 Graybar Electric Co. catalog offers vacuum protectors of unspecified make, with (apparently) metal bodies, in two- and three-electrode ver-



Telegraph protector, ca. 1912 [3].



Vacuum tube arrester has standard railway signal association binding posts. No. 1518810 has 5 terminals, for lines, ground and instruments. No. 1518809 has only 3 terminals, 2 for the lines and one for the ground. No. 144585 has 3 terminals for line, ground, and instrument, while No. 148057 has 2, one for line and one for ground.

Cat. No.	Description	Std. Pkg.	Wt., Lbs. Std. Pkg.	Price Each
1518810	5-terminal, Double-pole	24	70	\$7.00
1518809	3 " " " "	24	70	6.00
144585	3 " Single " "	48	80	3.90
148057	2 " " " " "	48	70	3.35

sionss, for use on railroad signal lines.

None of the ads or catalog listings discuss the firing voltages of these units. Protectors on ordinary telephone lines operate at about 350 volts. However, protectors on intercity open-wire lines typically fired at about 700 volts.

These protectors must have been an im-

pressive sight when doing their job. Imagine a 20-conductor open-wire telephone line protected with, say, 10 three-electrode VAC-Ms. As a lightning storm rolled in from 50 miles west, every direct strike or near-miss would flash all the protectors - in either small glows or bright flashes - with the intensity growing as the storm center approached.

THANKS!

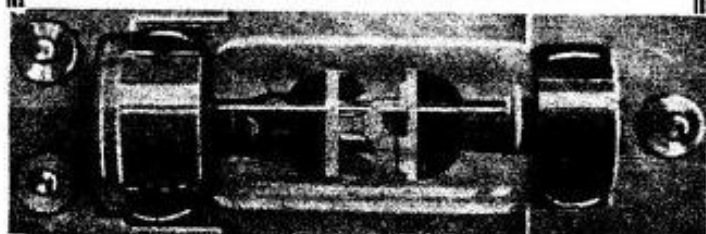
To Phil Rheinschild for coming up with the tubular dual-element VAC-M, and to Bob Deuel for loan of his based unit.

REFERENCES

1. Radio Trade Directory (New York: McGraw-Hill, Nov. 1924 and Aug. 1925 issues).
 2. T. E. Herbert, London: Whittaker & Co., Nicol, American Telegraph New York and London: Mc- (1913), p. 122.
- ement, *Telephony*, July 18,

VACUUM PROTECTOR ADS IN TELEPHONY

'VAC-M' Lightning Arresters Are Always On The Job



(No. 3 Cartridge Type)

The two-line feature embodied in this make of vacuum arrester is well worth your careful consideration—the fact of each line discharging in the same evacuated container insures equal distribution and balance.

SEND FOR CATALOG—FREE.

The National Electric Specialty Co.
Terminal Bldg., Toledo, Ohio
Sole Makers of 'VAC-M' Arresters.

Sept. 2, 1916

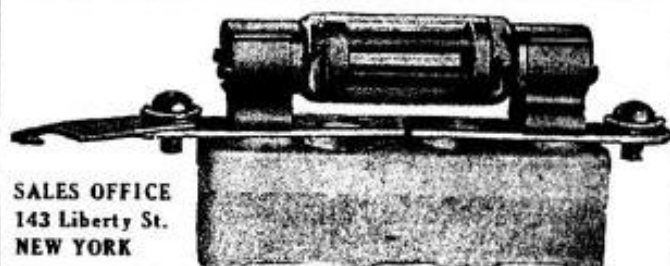
Brach Vacuum Arresters

Are you still maintaining your arresters or have you adopted the BRACH VACUUM SINGLE LINE TYPE NO. 36, or DOUBLE LINE TYPE NO. 40?

**Grounding
Impossible**

MAIN OFFICE AND FACTORY
127-129 Sussex Avenue
NEWARK, N. J.

L. S. BRACH SUPPLY COMPANY

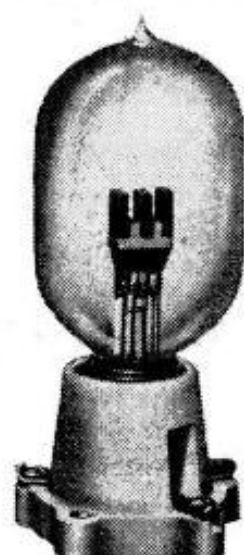


SALES OFFICE
143 Liberty St.
NEW YORK

Sept. 2, 1916

LIGHTNING

Need never be feared when using a



VAC-M Lightning Arrester

These arresters are now being furnished in quantities to the mountainous sections of the country and recent reports inform us of the remarkable service they are furnishing on Rocky mountain installations.

These Vac-M lightning arresters are especially adapted to telephone companies desiring upright design for metallic circuit protection.

National Electric Specialty Co.
TOLEDO, OHIO

Oct. 27, 1923

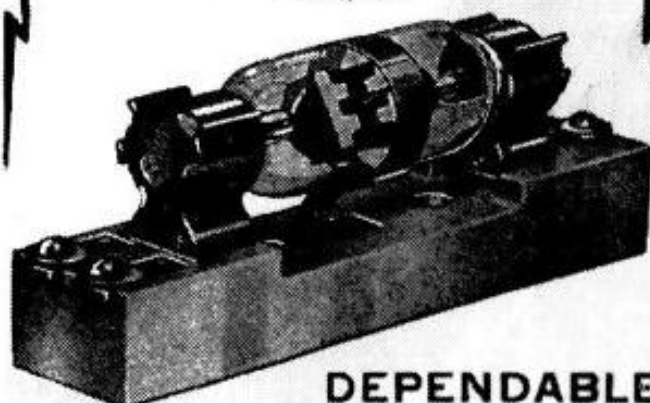
Stopped Short ! VAC-M ARRESTERS

That's what happens! When lightning or static—those wreckers of telephone service—hit your lines, VAC-Ms stop them short. Just like a policeman arresting a shoplifter.

VAC-M Arresters should be the "policemen" of all your telephone circuits.

"ONCE USED—ALWAYS USED"

THE NATIONAL ELECTRIC SPECIALTY CO.
Toledo, Ohio



DEPENDABLE

April 4, 1925