THE TELETYPE STORY

Modern communications center.

Early page printer

Teletype Corporation commemorated its Golden Anniversary in 1957. Fifty years is a short span in thehistory of Communication. Yet in that time, Teletype has developed its equipment from primitive models with limited use or acceptance, to the speedy precision machines which are an indispensable part of modern communications. Today Teletype equipment is an important economic tool, serving in many and varied ways the demands of our way of life.

This is the story of Teletype. It is a story of challenges met and problems solved, of faith in the future and of the surpassing of what were only dreams.

Progress in con

TOM-TOM TO TAPE

Tom-toms, church bells, smoke signals, the Dead Sea Scrolls, and the Pony Express – these are all milestones in the endless effort to bridge time and distance by improving communications.

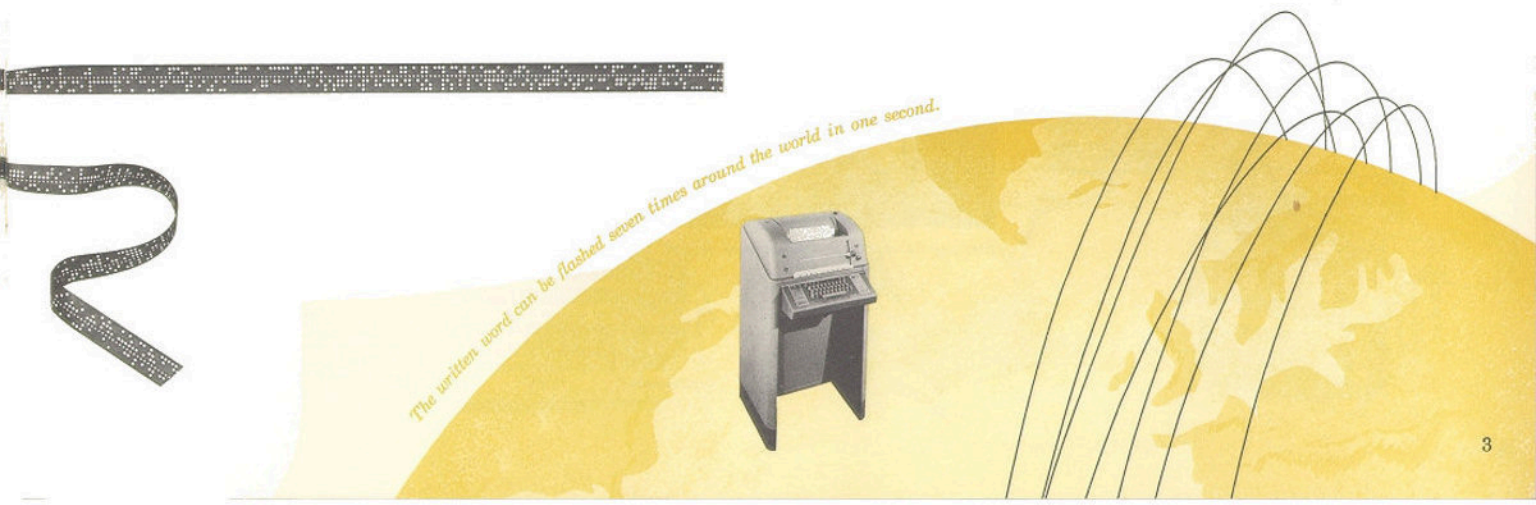
Until the 19th century the only reliable way to deliver a message was hand-to-hand or face-to-face. The fate of nations often hung on the arrival of a lathered horse and his spent rider. A thousand men died at the Battle of New Orleans because news of a peace treaty signed weeks earlier had not reached the opposing armies.

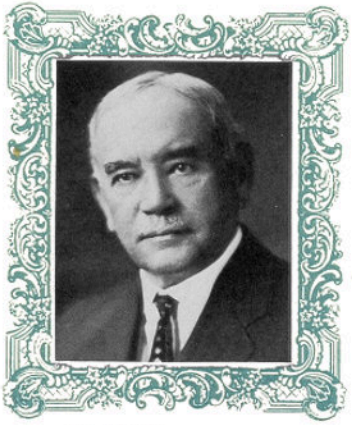
It was the harnessing of electricity that almost overnight catapulted communications into the modern epoch. With the sending of the first telegraph message by inventor Samuel F.B. Morse in 1844, both tine and distance were conquered with a single instrument.

But early telegraphic communication, amazing as it was, had its drawbacks. Rigorous training was needed for operators to acquire skill in transmitting and receiving Morse code. And it took *two* operators to get a telegram over the wires – the sender the Morse key to translate the message into dots and dashes, and another operator at the receiving and to listen for the code on the Morse sounder and write out the telegram by hand or on a typewriter.

What telegraphy needed was a system whereby the messages could be received automatically in the form of typewritten or "printed" alphabet characters instead of a series of audible dots and dashes.

An early attempt was the invention of Royal E. House of Vermont, patented in 1848. it has a piano style keyboard and used compressed air to actuate the mechanism, which employed a typewheel and printed on a tape.In 1855 David Hughes introduced an improved machine built along similar lines. A significant development occurred in 1874 when a Frenchman, Emil Baudot, worked out a system of printing telegraphy using a five-unit selecting code.





Joy Morton

Charles L. Krum

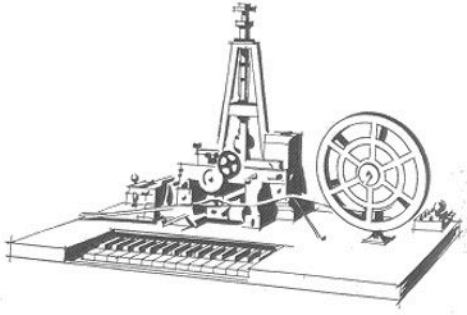
Daniel Peterkin

Original organizers of Morkrum Company were Joy Morton; his son Sterling, who was later to head the company; Mark Morton; Charles L. Krum and his son Howard; and Daniel Peterkin,who was Joy Morton's secretary.

Mark Morton

Sterling Morton

Howard Krum



TELETYPE BEGINS

The story began in 1902 when a young electrical engineer named Frank Pearne arrived in Chicago with a letter of introduction to Joy Morton, head of the Morton Salt interests. Pearne, who had been experimenting with a printing telegraph system, wanted financial help so he could keep working.

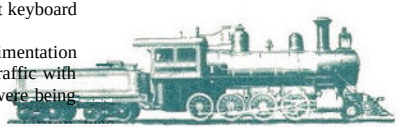
Morton talked it over with his friend Charles L. Krum, a distinguished mechanical engineer and vice president of the Western Cold Storage Company, operated by Joy Morton's brother, Mark. The verdict for Pearne was favorable, and a laboratory was set up for hire in the attic of the cold storage company.

After about a year of unsuccessful experiments Pearne lost interest and decided to go into the teaching field. Krum continued the work and by 1906 had developed a promising model. In that year his son, Howard, a newly graduated electrical engineer, plunged into the work alongside his father.

Experiment succeeded experiment, with many moments of doubt. But, overall, progress was encouraging, and finally the Morkrum Company -named for Morton and Krum, and later to be re-named Teletype Corporation-was incorporated on October 5, 1907, with a capital of $150,000.

THE FIRST TEST. By 1908 a working model was made which looked good enough to test on an actual telegraph line. The printing portion was a modified Oliver typewriter, mounted on a desk with the necessary relays, contacts, magnets, and interconnecting wires.

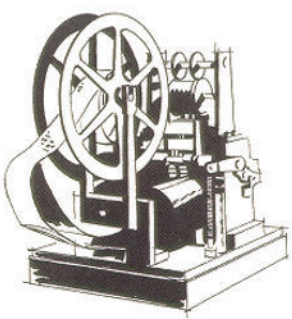
Joy Morton, who was a director of the Chicago and Alton Railroad, arranged for a trial on the railroad's wires between Chicago and Bloomington, a span of about 150 miles. The test of the experimental printer was highly promising and Charles and Howard Krum went back to work, making more models and improving them, seeking to develop a small neat, direct keyboard typewheel printer.

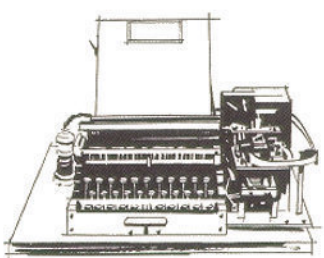


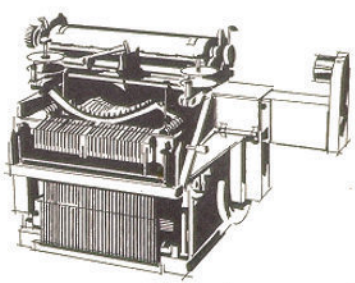
This was a period of basic invention and experimentation with printing telegraph. Western handling part of its traffic with the Barclay system; the Hughes and Baudot systems were being used abroad, and there were many others.

Each system had advantages, disadvantages, imperfections. In general. they were apt to be extremely delicate, overly complicated, and too expensive in manufacturing cost and maintenance to be practical. The most serious problem was maintaining synchronism between the sending machine and the remote printer. If the distant unit was “off;” it would receive the signals in improper sequence and print gibberish. For reliable transmission, the sending and receiving units had to be “in step” with each other-and the synchronism had to be maintained throughout transmission.

It remained for this problem to be solved before the printing telegraph concept could take giant steps in the communication world.

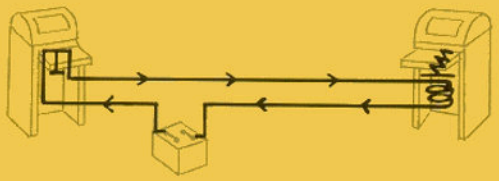




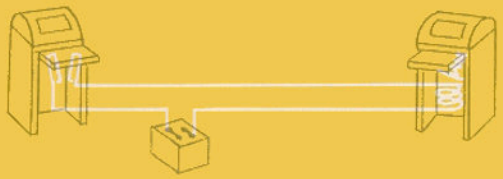


Early communications equipment

HOW A MESSAGE IS SENT BY ELECTRICAL PULSES



When the contact in the signal line is closed, *current flows and the line is said to be "marking." A MARKING* PULSE *is generated when the contact is held closed for a fixed length of time.*



When the contact is opened, no current can flow and the line is said to be "spacing." A SPACING PULSE is generated when the contact is held open for a fixed length of time.

Each character consists of five electrical pulses which may be either marking or spacing. Black indicates a marking pulse, white a spacing pulse.

Using the letter "D" as an example, pulses one and four are marking while pulses two, three, and five are spacing.

In addition to the code pulses, (which transmit the message) each combination is preceded by a start pulse (always spacing) and followed by a stop pulse (always marking).

TECHNICAL TRIUMPHS

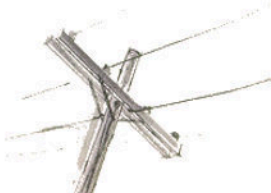
Among Howard Krum's many contributions to printing telegraphy, one of the most significant was his solution for the problem of synchronizing sending and receiving units.

A brief look at how Teletype equipment works is helpful in understanding his accomplishment.

Teletype machines operate by the transmission of electrical "pulses" over wires from a sending unit to a receiving unit. The sending unit creates the pulses by mechanical action following the pressing of typewriter-like keys. The receiving unit converts the pulses back into mechanical action, producing typed letters or figures. The electrical "pulse" can best be described as a brief electric flash, or flow of current, stopped or started at will. The illustration on this page graphically explains this action.

With the Morse telegraph, the operator who receives listens to a series of unequal dot-dashes which constitute a code, and theft translates them into the written word. Teletype machines "listen" to a code in which each letter or number is made by a combination of electrical pulses of equal length and automatically translate this code into printing. But the receiving machine must be "listening" in unison with the sending machine.

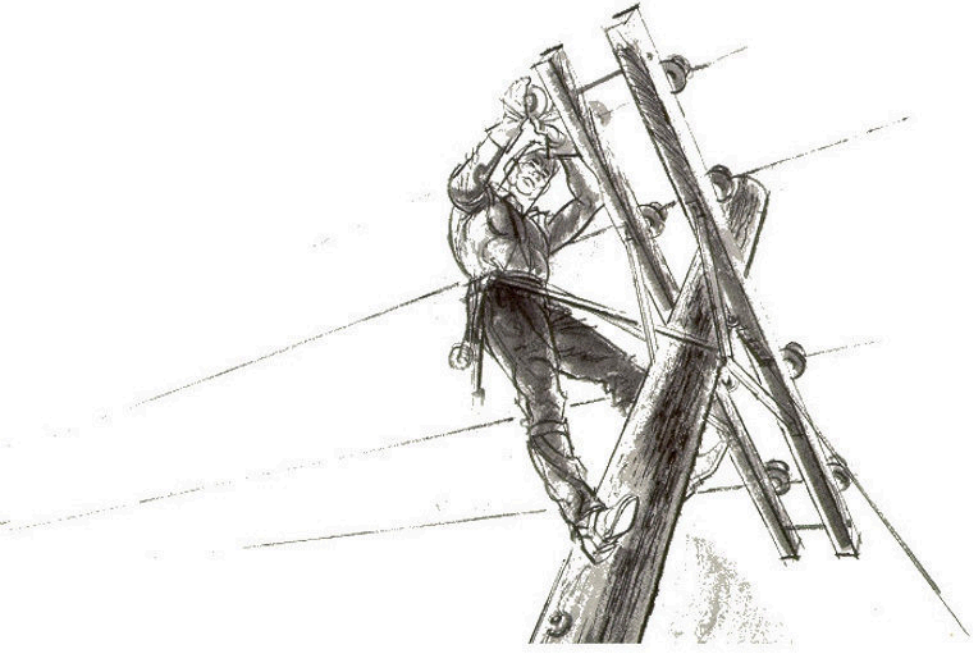
Howard Krum's idea for keeping sending and receiving machines together was to add a "start" pulse before each code combination, and a "stop" pulse after each code combination. This provided a fresh start and a "correction" period for each character and made it comparatively simple to keep the sending and receiving machines in step for the fraction of a second required to transmit a character code combination. Thus full synchronization was achieved.

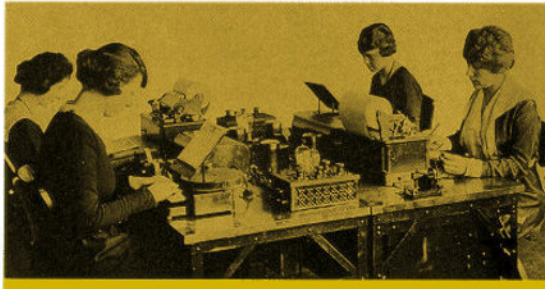


FIRST SALE. A significant milestone in the young company's life-its first commercial sale-occurred in 1910. In that year the Postal Telegraph System - since merged with the Western Union but then the second largest telegraph company in the country - authorized Morkrum to make an installation on its lines between New York and Boston. Postal Telegraph had been concerned as to whether the Morkrum system would function on ordinary telegraph lines in good and bad weather. The installation proved most successful. Two years later Postal had eight Morkrum circuits, averaging 300 miles in length, the longest being the 1,000 mile New York to Chicago line.

In 1912 Western Union became a customer, and by the middle of that year had six circuits in operation. Equipment was so improved by this time that there is a record of 1,207 messages exchanged in one nine-hour day, and an instance of an operator sending 104 messages in one hour between Boston and New York.

About this time the Chicago, Burlington & Quincy installed Morkrum printers between Chicago and Galesburg, Illinois. This was soon followed by installations for the Rock Island, New York Central, Lake Shore, B. & O., and the Canadian Pacific.





Early Western Union installation.

Associated Press news room, New Yor

AP, New York, 1915

SPEEDING THE NEWS

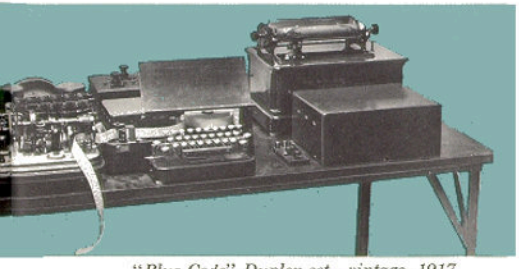
In 1914 the Associated Press became seriously concerned about its method of distributing news to its member newspapers in the New York area. Dispatches went out by pneumatic tube and messenger boy, and by Morse telegraph to the larger papers which could afford receiving operators. There was much dissatisfaction because news got to some papers faster than it did to others.

The problem was turned over to Kent Cooper, a young man in AP's Chicago office destined later to become general manager of the press association. Cooper called in Howard Krum and discussed with him the possibility of using the Morkrum printing telegraph for press service.

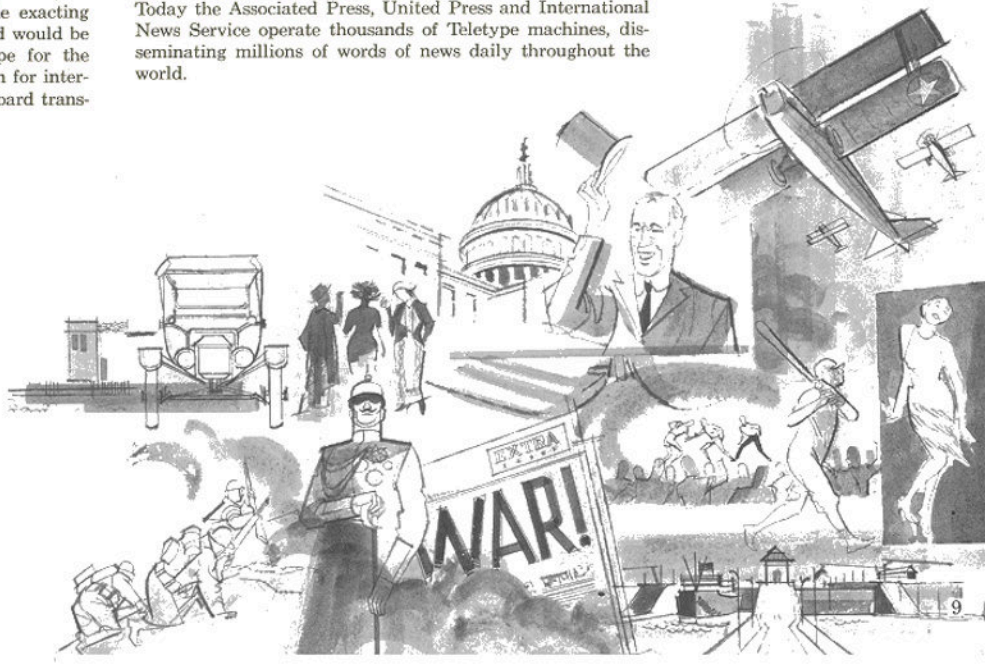
By that time, Morkrum had a tape perforator, already in use in commercial telegraph service. To meet the exacting press needs, the men decided that the best method would be automatic transmission from punched paper tape for the steady stream of regular dispatches, with provision for interruption by news flashes to be sent by direct keyboard transmission from a Morkrum printer. The individual newspapers would have Morkrum page printers and receive the dispatches on roll paper.

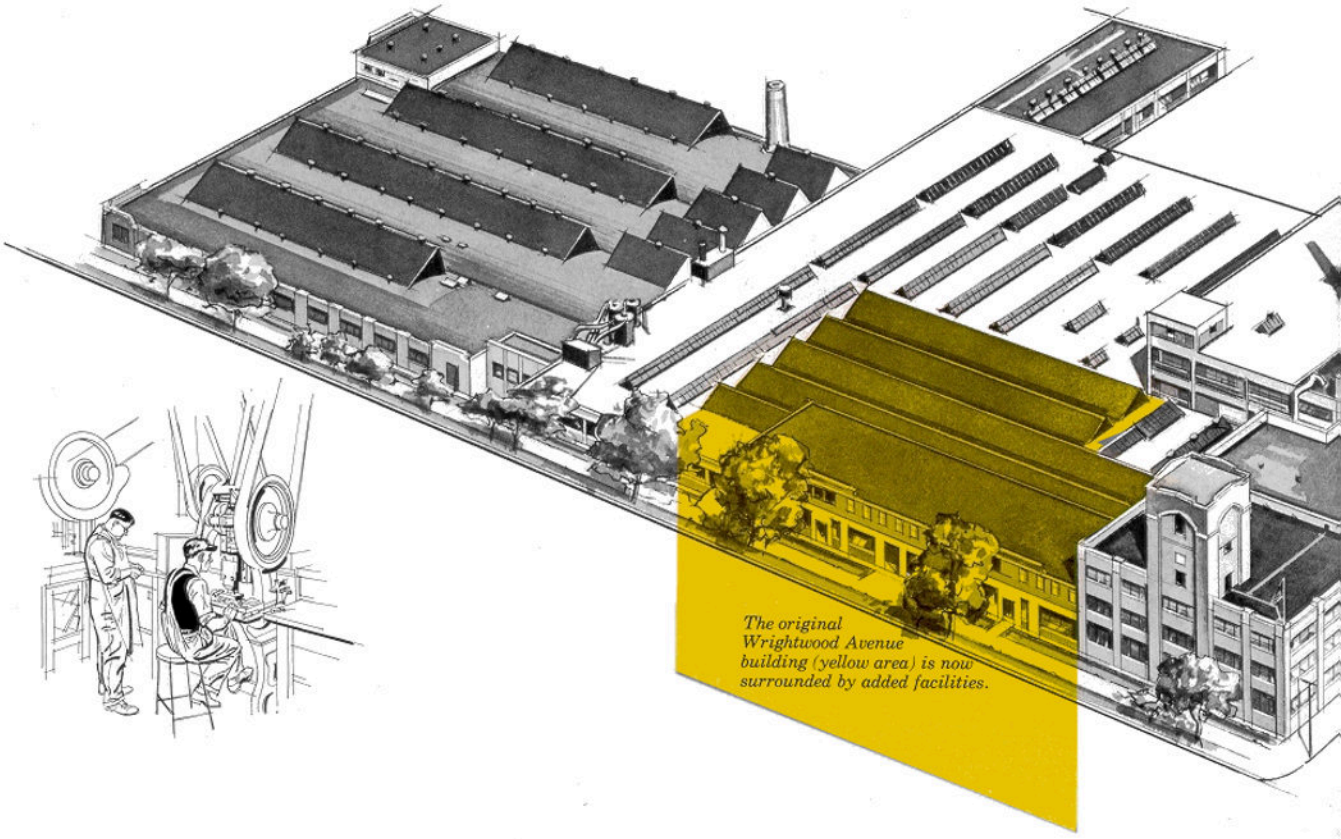
With the perforator, the news could be punched into tape at very high speed, since this instrument was not connected to the telegraph line. The tape was then fed into a transmitter, which sent the signals over the telegraph line automatically. This arrangement made for higher over-all speed and much greater efficiency.

A trial of the setup proved a resounding success. News dispatches reached all AP papers in the New York area *simultaneously* and much faster than had previously been possible. Other press associations quickly adopted printing telegraphy. Today the Associated Press, United Press and International News Service operate thousands of Teletype machines, disseminating millions of words of news daily throughout the world.

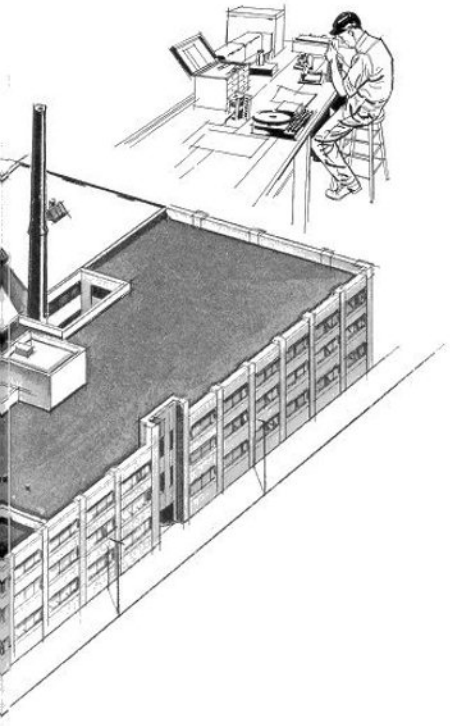


"Blue Code" Duplex set—vintage, 1917





The original Wrightwood Avenue building (yellow area) is now surrounded by added facilities.



The outbreak of World War I and subsequent entry of the United States led to a shortage of skilled Morse telegraphers for civilian needs.

The result was to focus attention on printing telegraphy. A trade journal of those days remarked, "With this system it is not necessary for the operator to understand the Morse code, as anyone who can operate a typewriter keyboard can do the work. The system also greatly increases the capacity of the telegraph lines'.'

During this period the Pennsylvania Railroad undertook an extensive program of replacing Morse circuits with Morkrum equipment. The Union Pacific also installed equipment, followed by others, and commercial telegraph and press circuits were extended.

An unusual application for those times was the setup developed in 1917 for Carson Pirie Scott & Company, one of Chicago's great department stores, linking its warehouse and wholesale departments. The system immediately proved to be a great time saver.

That year, Sterling Morton became active in the company, assuming the presidency and directing sales.

By 1918 the young company had grown to the point where it could think of a plant of its own in place of rented quarters. A survey showed that a majority of the 200 employees by then on the rolls would be best served by a location on the north side of Chicago. Accordingly a site was selected on Wrightwood and Southport Avenues, and a building with an area of 35,000 square feet was constructed. The first payroll in the company's new home was figured out on Thanksgiving Day.

About this time, also, the company embarked on a diversification program to fill the gaps between orders for printing telegraph machines. Various items were manufactured, in cluding penny pencil sharpeners, wire braid removers, an air gauge for tires, a patented lock for automobiles with an “unpickable” combination, and a check handling machine marketed under the name of the “National Check Endorser:”

To make even better headway financially, a change was also made in the method of marketing Morkrum equipment. Up to this time most of the Morkrum machines in the field were being leased to customers on a monthly rental basis. This policy was now abandoned in favor of outright sale.

Model 12 in typical police installation, Worcester, Mass., 1930.

Research and development, always the lifeblood of the business, proceeded at a swift pace. The Model 11, a compact machine operating at 40 words per minute and using a typewheel to print on paper tape (somewhat like a stock ticker) was introduced for light duty service. It was to this machine, incidentally, that the name "Teletype" was first applied, and it was in the company's sales literature on this unit that the Teletype scroll symbol, selected through an employee contest, was first used. The year was 1921.

One of the earliest installations of the Model 11 was in the Congress Hotel in Chicago in 1922, permitting registration, departure, billing, and other information to be transmitted simultaneously to various departments in the hotel.

Next to come along was the Model 12. This page printer with typebars like a typewriter, was the first Morkrum machine to be used extensively by general business firms, in private wire service. It was also quickly adopted by the press associations, and for many years "delivered" practically all the press wire news in the United States and Canada. Its construction was so rugged that the first installation - a network of 37 printers put in for the Chicago Police Department in 1922 - did not require replacement until 1956. In all, 12,000 Model 12's were sold, two as recently as 1943

About this time Morkrum began to experiment with radio transmission of printing telegraph signals, a pioneering effort which was to pay huge dividends in World War II.

Printed messages were sent by "wireless" in 1923 from the transmitting tower at the Wrightwood Avenue plant to the home of Sterling Morton in Lisle, Illinois, some 30 miles away. That same year test messages were sent from Chicago to Milwaukee, Wisconsin and Lafayette, Indiana.

In 1924, the telegraph companies began to turn their attention to the use of printers on their tributary circuits, as well as the pick-up and delivery wires between their main office and branch and customers' offices. For this service they wanted a heavy-duty tape printer. With tape printers it is not necessary to return a carriage or start a new line. Telegraph line time is conserved and the machines themselves are simpler and less expensive.

Morkrum thereupon developed the Model 14, a typebar tape printer so simple and sturdy it could be installed in the most remote telegraph office with only rare visits from the maintenance man. This machine, introduced in 1925, was the first printer to be almost wholly mechanical. Messages were (and in many telegraph offices still are) printed on gummed 3/8" paper tape, which the operator pasted onto the familiar telegraph blanks.

MERGER - AND A NEW NAME - During these years of the Morkrum Company's growth and development the Kleinschmidt Electric Company, formed by inventor Edward K. Kleinschmidt in New York, was also manufacturing printing telegraph instruments and serving some of the same customers, particularly the telegraph companies.

In 1924 a patent conflict developed between the two firms. This led to a meeting between Sterling Morton and Charles B. Goodspeed, who was associated with Kleinschmidt Electric. Out of their session came a six-line memorandum which became the basis for a merger creating the Morkrum-Kleinschmidt Corporation, with Sterling Morton as president and Edward Kleinschmidt and Howard Krum as vice presidents. The Wrightwood plant was enlarged, and the new company embarked on a period of phenomenal growth.

1925 saw the establishment of the company's Development & Research Department, complete with its own model shop and testing laboratories. It was soon engaged in a variety of new projects, including an improved page printer, a fire alarm system, a method of setting type by wire in newspaper and printing plants, and a transmission system for automatic stock quotation display boards.

The Teletype School of Maintenance Training was also established during this period. The school offers tuition-free classes of several weeks' duration in which customers enroll their personnel for instruction in the operating theory, adjustments, and maintenance of the various Teletype apparatus units. Classes are held on a regular schedule throughout the year.

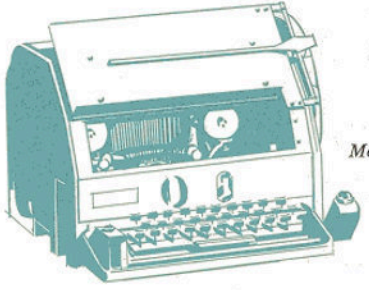
As the '20s drew to a close, trading on the New York Stock Exchange became so heavy that the old stock tickers, running at about 200 characters a minute, were unable to keep up with the volume. Teletype developed a high speed stock ticker, operating at 500 characters a minute. One of the interesting features of this machine is that it employs a six-unit code for the purpose of saving the operators at the Exchange transmission headquarters the time required for operating the shift keys. The sixth pulse was added to characters in the "Figures" position and acts as an automatic shift.

The ticker was introduced in 1928, and was soon placed in service in the offices of hundreds of their clients in the United States and Canada by Western Union and the New York Quotation Company.

In December, 1928, the company's name was changed for the sake of simplicity from Morkrum-Kleinschmidt Corporation to Teletype Corporation. Thus its equipment trademark also became its corporate name.

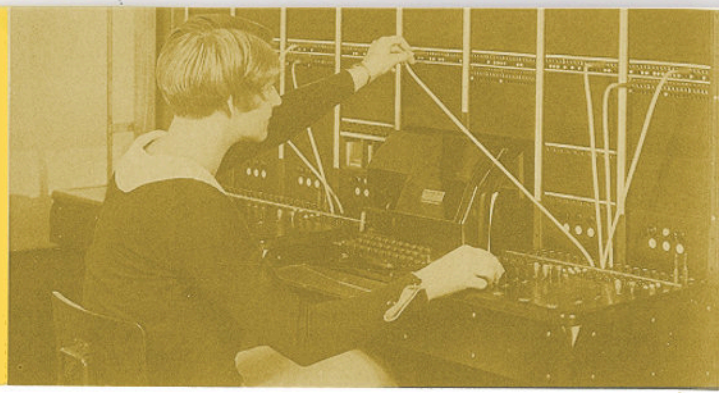
By the end of 1929 Wrightwood headquarters covered 280,000 square feet of floor space in twelve buildings, eight times the space occupied just five years before, and employment had risen to 2,400. Production figures revealed that a revolution had taken place in communications. From 1918 to 1927, 15,500 Teletype instruments were made. In 1928 alone, 12,700 instruments were produced, and 1929 production reached 25,200 for the one year. And these instruments were in service not only in the United States and Canada but also in many countries abroad.

Model 11 transmitting intra-hotel information, 1922



Model 14 tape printer

Early TWX switchboard



Typical TWX switchboard facilities in use today in Central Offices of Bell Telephone Companies.

1930 marks another important milestone in the company's history. In that year, the Teletype Corporation was purchased by the American Telephone and Telegraph Company and became a subsidiary of the Western Electric Company. Sterling Morton, who had been president of the company since 1917, retired from the scene, as did Edward Kleinschmidt, who had been a vice president since the merger in 1924. Howard Krum stayed on for some years as a consultant, guiding the company's development and research program.

For some years prior to its acquisition of Teletype, Western Electric had itself been a manufacturer of teletypewriter equipment, making apparatus of its own design. Gradually, however, the company withdrew from the field and Teletype, as a specialist, supplied more and more of the equipment needed by the Bell System for private wire service to business firms.

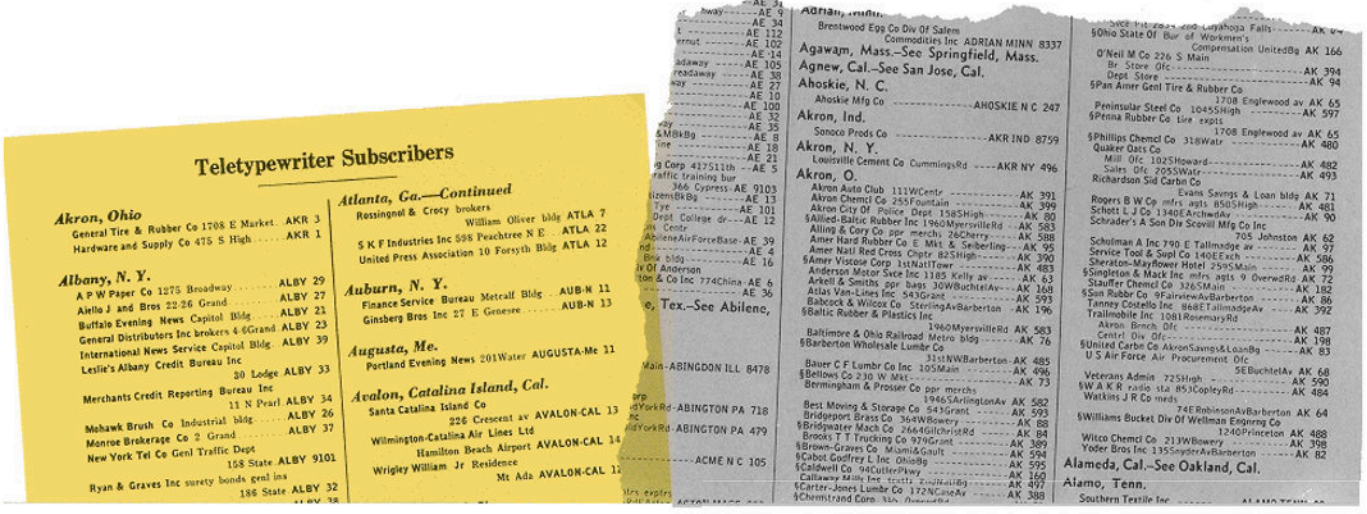
While the Bell System used the Model 12, they indicated a desire for additional features that would be an advantage in private wire service. The Model 15, placed in volume production in 1930, incorporated these features and many others.

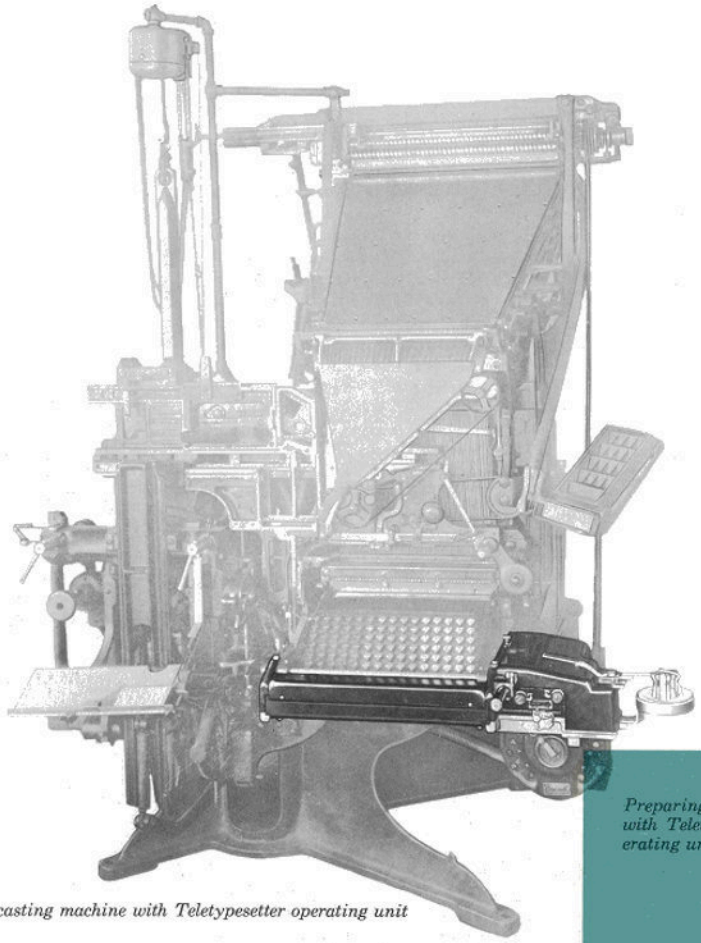
This became the standard Teletype page printer that was to see service all over the world.

Quieter in operation than the Model 12, it was also less bulky. Of major importance was the fact that the paper platen which on the Model 12 moved as the message was typed-remained stationary while the type basket moved across the paper, eliminating paper feeding problems.

The machine also offered a broader scope for extra features, such as control of associated equipment, tabulating mechanisms, and handling of business forms. In design, it was as nearly as possible a page version of the Model 14 tape printer, with all that unit's mechanical simplicity, sturdiness. and extreme reliability for unattended services.

With the Model 15 printer available. the Bell System inaugurated TWX - teletypewriter Exchange Service - in 1931. Subscribers were able to type by wire to each other, through a switchboard connecting system, just as they could talk to each other by telephone. The big advantage was that a written record of the message was available at both ends. In its first year an average of only 50 TWX messages were sent daily. Now approximately 40,000 teletypewriters send





Line-casting machine with Teletypesetter operating unit

almost 100,000 messages over a huge nationwide network every day.

In 1932 Teletypesetter equipment was introduced to the newspaper and printing fields. This is essentially a combination of teleprinting and machine typesetting. Using paper tape perforated in six-level code, the "TTS," as it has come to be called, replaces manual operation of linecasting machines with automatic operation at high speeds, producing double or more the output normally obtained by manual methods.

When used with its associated Teletype equipment, TTS can also set type at many distant points simultaneously. Thus it is used by newspapers not only for local copy but to speed press association stories directly into type, and by large weekly magazines and financial dailies which must be printed in several plants simultaneously. It has also found many interesting uses in specialty printing, such as directories and greeting card imprints.

Another development which reached maturity during the '30s was that of message relaying. In extensive network, with a large number of machines, it is neither economical nor practical to set up wire lines so every printer can contact every other printer in the network directly. Instead, relay points or message centers are established which accept traffic

Preparing tape for use with Teletypesetter operating unit

from the surrounding areas and send it along to its destination or the next relay point.

In early days such relaying was handled by redoing the messages on a printer or perforator keyboard. This was plainly a duplication of effort. In 1925 Morkrum made an early form of "reperforator" or receiving perforator for the Associated Press. This provided the relay points with the press stories in punched tape, and they could be sent along by simply feeding the tape into a transmitter-distributor.

A production reperforator was introduced in 1928. Principal users were the railroads, the Bell System, and, afterwards, the military.

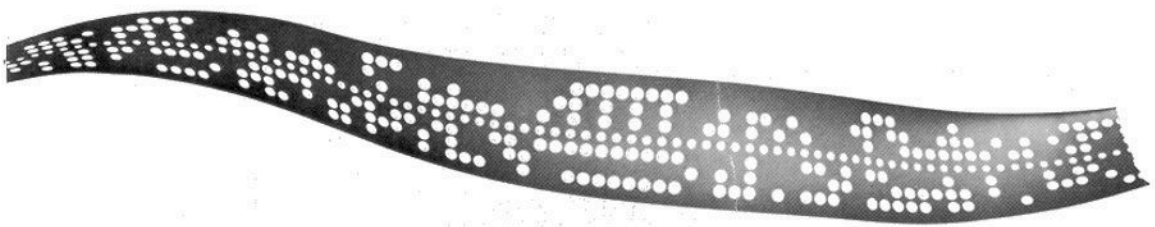
Later a unit was developed which combined a reperforator with a typing mechanism-the famous "typing reperforator" -which eliminated the need for the attendants at the relay points to know the Baudot code. The unit was first used in a system installed by the Postal Telegraph-Cable Company in 1940. It was in this system also that. multiple-mounted transmitter distributors and message numbering transmitter distributors were first used, all of the equipment being grouped in cabinets.

This came to be known as the "torn-tape" method of message relaying, because the attendant severed each message as it came in simply by tearing it, after which it was fed into the transmitter by hand. It is still the simplest and most flexible method of relaying and is in wide use today. Another method of relaying, called "push button" or "semi-automatic" was developed later by the Western Union Telegraph Company. Here the attendant reroutes the message by reading the address on the tape, then pushing a button to switch in the appropriate transmitter-distributor.

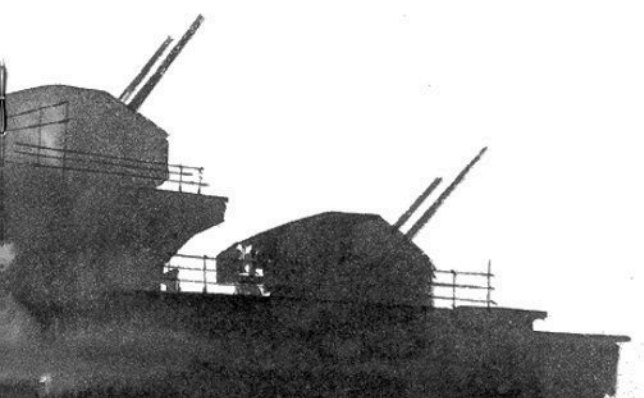
As industry expanded following its recovery from the depression of the early thirties, establishing a pattern of widely scattered branch plants, many companies turned to Teletype equipment as an efficient means of centralizing operations and communications. Two of the private wire networks engineered just prior to World-War II, for General Electric and Republic Steel, were milestones in the printing telegraph art. They were equipped with the first fully automatic switching systems, developed by the Bell Telephone Laboratories, with Teletype designing special printing telegraph components and cabinetry.

The automatic: equipment at the communication center does an almost miraculous job. It "reads" the address code on the incoming message and directs it to the proper destination or to several destinations simultaneously. If the line should be busy, it can store the message temporarily for transmission later. It also controls the starting and stopping of machines at outlying points, and acts as a "traffic cop" to level out message flow.

Operator relaying messages with "torn tape" central office equipment




TELETYPE IN



When World War II started, armies needed words with wings. Quick, accurate communication-with a written record available-was vital to the movement of millions of men and women, vast quantities of munitions, hundreds of thousands of vehicles and supply items, and thousands of planes to and from every corner of the world.

Teletype, like other firms, was to know some unfamiliar assignments, such as the manufacture of component parts for gun directors. But its real war task was to manufacture its own communications equipment-and to produce that equipment in the greatest possible quantities and the shortest possible time. The Wrightwood plant went to three shifts, additional space was leased, thousands of new employees were hired. Subcontractors by the dozen were called upon for help, “expediter” and “coordinator” became familiar words.

For the lines of command reached everywhere-from Washington, from London, from Australia, from Pearl Harbor, from field headquarters, and from flagships at sea. Wherever men and women were involved in the struggle because rapid and accurate communication often meant the difference between victory and defeat there also were Teletype machines.

Circuits were developed into systems and systems into world-girdling networks that stretched from igloos to South Sea jungles, from offices in the Pentagon to command posts in German castles.

In the field the teletypewriter moved with the arms. On the sea, it moved with ships. Maintenance and shipping difficulties caused by differing climates, transportation, and rough handling, were met and overcome.

The variety of installations was almost infinite. Masses of messages were carried between principal centers in this country, and then fanned out to ultimate destinations.

Tactical circuits were in constant use for ordering equipment, troops, and planes into immediate action.

Control of the flow of supplies and personnel, coordination of production and the vital administrative message traffic required more and more Teletype equipment at home. Overseas, command circuits connected principal headquarters with air fields, with troop centers, and with warships.

The pace at Teletype quickened to meet the challenge and production soared until in 1944 it was 15 tithes what it was in 1939. That year the men and women of Teletype received the Army-Navy "E" award for their production record.

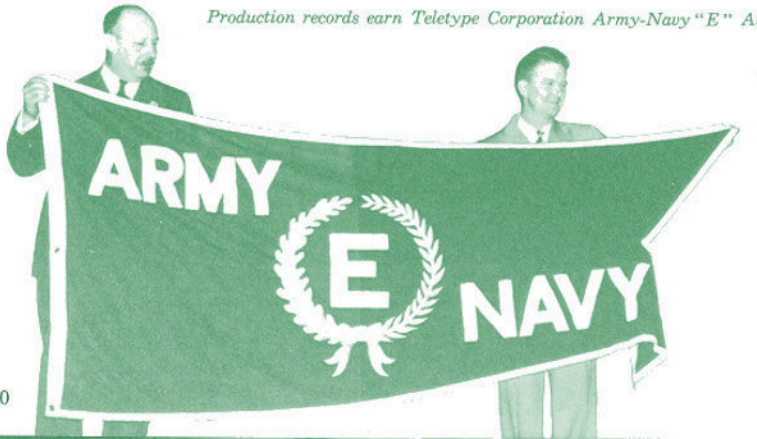
Novel special applications were developed during the war. By modifying a page printer and connecting it with an optical projector, visual briefing material was flashed aboard carriers from a central point to pilots' ready rooms. An adaptation of this idea created a new word - and a new idea - teleconferences between groups widely separated.

One use of Teletype equipment which caught the imagination of the world was for personal "conversations" between President Roosevelt and Prime Minister Churchill. A secret device scrambled the messages beyond the possibility of their being decoded if intercepted by the enemy.

On June 6, 1944 there was sent one of the most dramatic Teletype messages ever transmitted. In newspaper offices and radio stations throughout the country the "stand by" warning was typed out. A few minutes later came the signal for news that would change the course of the war - then FLASH! "Eisenhower Headquarters Announces Allies Land in France."

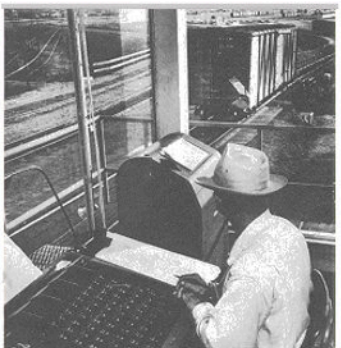
For Teletype perhaps one of the most important results of the wartime use of its equipment was that millions of people from all walks of life personally discovered this efficient communication medium for the first time while in service. This created a powerful impetus for its expansion into peace-time uses. In addition, numerous installations overseas, many of which became war surplus, were purchased by foreign governments and organisations.

Production records earn Teletype Corporation Army-Navy "E" Award in 1944



Field headquarters Teletypewriter installation of First Division at Sourbrodt, Belgium, January, 1945

EISENHOWER HEADQUARTERS ANNOUNCES ALLIES LAND IN FRANCE



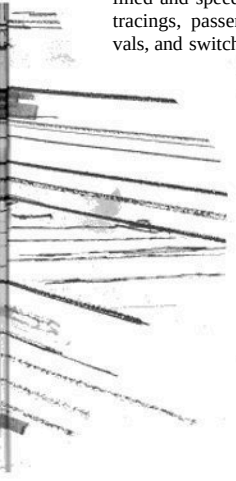
Teletype printer records individual freight car data in yard control tower.

TELETYPE TODAY

With the coming of peace, Teletype returned to its civilian role, and was soon hard at work to meet the backlog of demand built up during the long years when all effort was devoted to winning the war. To this backlog were now added the demands of a rapidly expanding economy. Teletype equipment came into ever wider use to solve new communications problems resulting from distance, complexity, faster pace, and heavier volume of business.

Military communication needs also continued substantial, with American troops more scattered than they had ever been before, on practically every continent. When the Korean conflict broke out, large quantities of Teletype equipment were required. A continuous development program to meet defense needs resulted in the introduction of such equipment as the electronic multiplex (for sending several messages simultaneously over a single channel), a torn-tape relaying system packaged and powered for easy transfer from one location to another, and a 600 speed tape transmission system.

RAILROADS - By this time Teletype equipment was in service for railroads in a great number of ways. It streamlined and speeded up the handling of perishable freight, car tracings, passenger reservations, train departures and arrivals, and switching operations in freight classification yards.



To these were now added new techniques, such as "tape to card and card to tape," enabling the railroads to simplify and expedite the preparation and handling of train consists and manifests, and yielding important savings in their accounting procedures.

CAA WEATHER REPORTS - Shortly after the end of World War II an interesting project was undertaken for the Civil Aeronautics Administration, whose 600 weathermen in locations from Alaska to Florida send in hourly reports over a Teletype equipment network, going through regional relaying points and distributed throughout the system.

The problem was to place the pickup of data from the outlying weathermen on an automatic basis, to utilize the wire lines at full efficiency as well as eliminate the time the men spent waiting their turn to send reports.

Teletype developed a device known as the Sequential Control (SECO) so each man could punch his report in a tape, put the tape in a transmitter, and go about other work. The SECO at the regional receiving center automatically turns the transmitters on in proper rotation, picking up the taped messages. If the report from a station is not ready, SECO waits three seconds, then calls in the next station.

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WEB
DR W EKN Ø93Ø WEATHER
EKN E1ØØ⊕1Ø 19/8→4/Ø11

WEB
DR W FRR Ø93Ø WEATHER
FRR 12Ø⊙E25Ø⊕12 278/27/18↗2/Ø31/ 6Ø8

WEB
DR W DCA Ø93Ø WEATHER
 E3ØØ⊕7 291/29/1Ø←↙5/Ø38 3ØØ 1ØØ7

WEB
DR W MRB Ø93Ø WEATHER
MRB E12Ø⊙25Ø⊕12 278/25/13↑3/Ø31/ 71Ø
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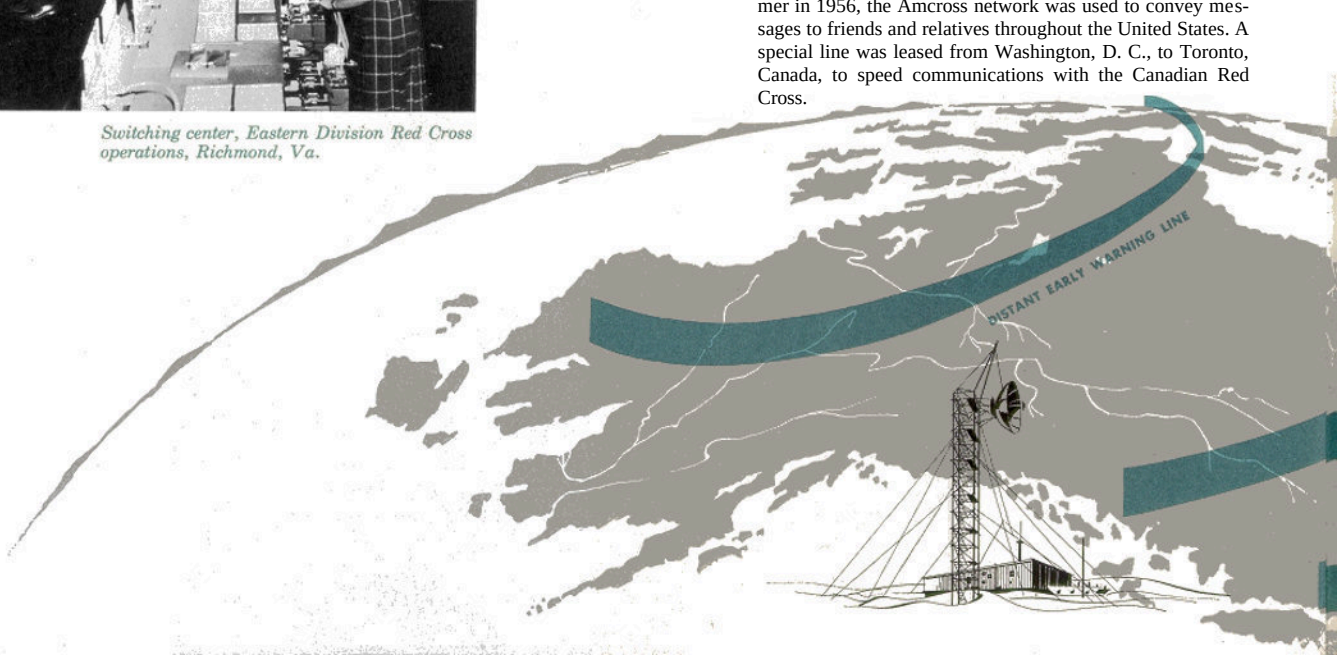
Coded hourly Weather station reports

Switching center, Eastern Division Red Cross operations, Richmond, Va.

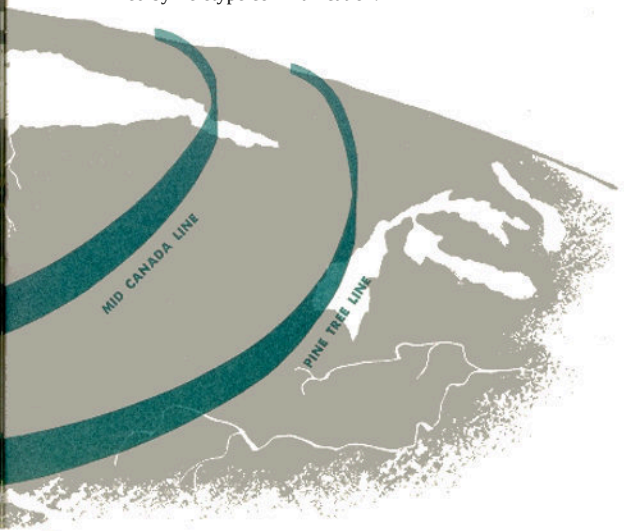
THE RED CROSS - The American Red Cross has long operated a nation-wide leased wire Teletype installation tied in with overseas points to provide a world-wide emergency message center for members of the Armed Forces. The system is used in disasters when normal communications are disrupted. In these cases, mobile Red Cross units equipped with radio Teletype apparatus fill in until commercial service is restored. In a major disaster, these mobile units may handle more than 5,000 messages a day. Over-all, the "Amcross" system has grown until it now handles more than sixty million words a year.

When Hungarian refugees were flown into Cramp Kilmer in 1956, the Amcross network was used to convey messages to friends and relatives throughout the United States. A special line was leased from Washington, D. C., to Toronto, Canada, to speed communications with the Canadian Red Cross.



OIL FLOW REGULATION - An interesting use involves the reguation of the flow of oil through pipe lines. Linked by a teletype network, a central control point automatically receives information from a number of locations, known as booster stations, as to oil flow. These stations are spotted long a pipeline which may be thousands of miles long. information received at the control point is the basis of regulation of flow through the line, either from wells or "tank farms" to meet refinery requirements.

THE DEW LINE - Standing guard in far Northern Canada, the Distant Early Warning Line is a vital element in our defense against air attack. Teletype equipment plays an important part in its communication system. Similarly, Continental Air Defense Command, charged with initial active air defense based largely on DEW Line information, is linked by Teletype communication.

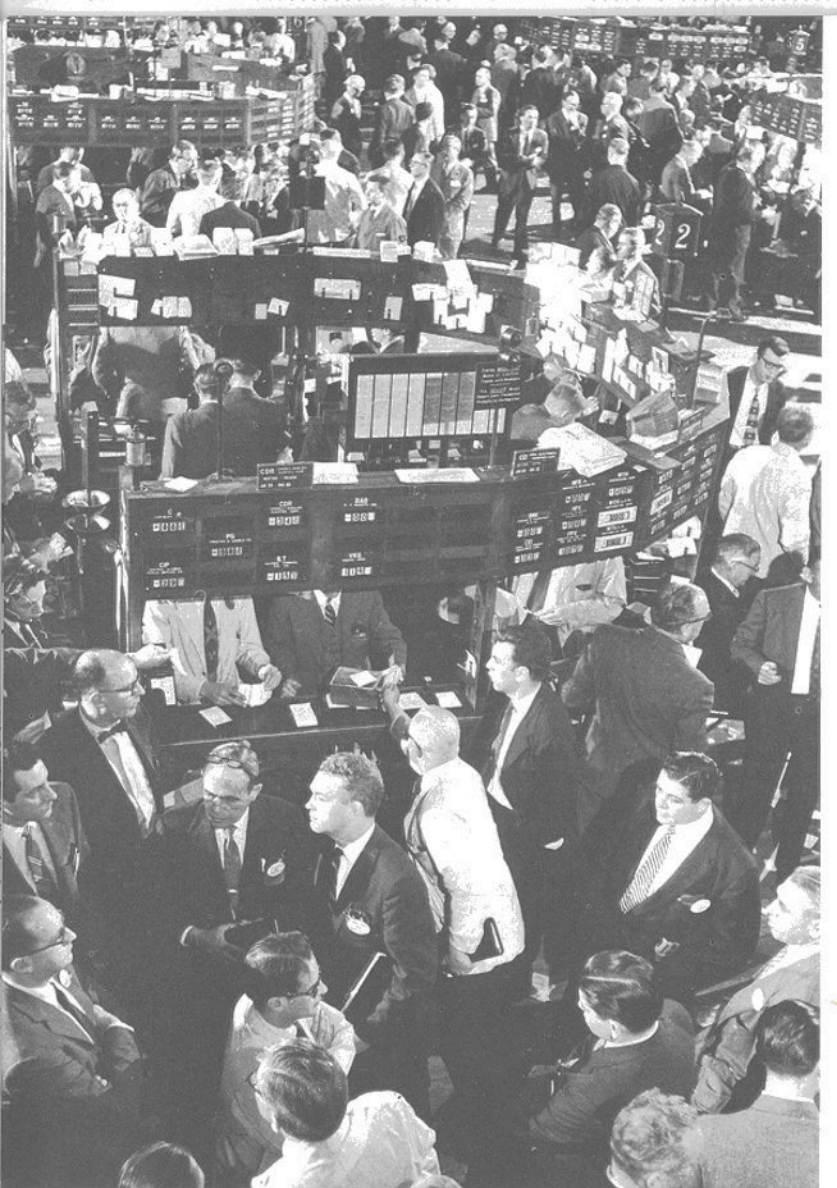


NATIONAL POLICE NETWORK - One of the most interesting and important Teletype equipment networks in operation today is the coast-to-coast state police system-a great advance from the first localized police system, installed in Chicago in 1922.

The National Police Teletypewriter Network, which began operations in 1956, links 43 states and the District of Columbia. The communication network of each individual state is linked to the national network through a central location in the state, from which messages can be flashed to similar central points in other states.

The system provides accurate and instantaneous printed communications, minimizing confusion and errors, and furnishing "documentary evidence" in flashing such items as warrant requests thus greatly facilitating the handling of jurisdictional problems.

Police Teletypewriter communications center, Los Angeles, Calif., 1957



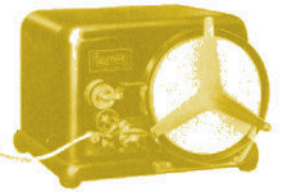
New York Stock Exchange trading floor

FINANCIAL USE - Nowadays it is commonplace for stock exchange member firms to depend heavily upon Teletype equipment, not only for quotation service, but also as a vital link in their large and exacting communication requirements.

In a typical case, the order of a branch office customer for the purchase or sale of securities will be teleprinted directly from the distant office to the New York Stock Exchange floor. The order is filled and confirmation teleprinted back to the originating office - all in a minute or two. With the confirmation, a copy is sent simultaneously to the accounting department, saving much clerical effort.

In another typical case, billing machines in branch offices go to work after the market closes, automatically typing out confirmations of each trade made that day by local customers. The data for these trades are computed on business machines in New York, translated onto teleprinter tape, and wired to each office.

THE AUTOMOBILE INDUSTRY - Automobile manufacturers were early users of 'teletype equipment. Today they not only have large private wire networks for their internal communications needs, but also use Teletype equipment in specialized ways. For example, the modern automobile assembly line handles a succession of body styles, colors, and optional equipment in astonishing variety, made up to the orders of individual



Market quotations are flashed to all parts of United States and Canada via Teletype stock ticker

customers. A Teletype equipment network is used in scheduling the hundreds of assembly components and special accessories, to insure the flow of material to assembly points in proper sequence.

INTERNATIONAL EXCHANGE - TEX, the Radio Corporation of America's Teleprinter Exchange Service, provides two-way international communications to subscribers in more than 30 countries. American Cable and Radio System offers International Telex, a similar service, reaching thirteen countries from the United States and Canada. Both services are available to TWX subscribers, thus forming a world-wide system for person-to-person interchange of the written word.

Leased Channel Service, the radio equivalent of leased private wire service, provides channels to international airlines, industrial organizations, stock and commodity brokers, and departments of the government for their own exclusive use.

AMATEUR RADIO - Thousands of radio "hams" now transmit via Teletype equipment. In addition to providing an absorb, ing hobby for an increasing number of men and women, ham radio constitutes a communication reserve for emergencies, often being of invaluable aid where other means of communication are not available. Ham radio is also important in civil defense.

Transmission equipment at assembly control center in automobile plant. Details of customers' orders go to specific points along assembly line, making possible "custom-made" cars on production basis.

1400 Wrightwood Avenue

NEW PLANT FACILITIES - Meeting the heavy post-war demand for Teletype equipment has necessitated a steady program of enlarging facilities. In 1950 Teletype acquired a manufacturing plant with 115,000 sq. ft. of floor area at 5701 Touhy Avenue, Niles, Illinois, just northwest of Chicago. In 1954 a large plant, with 376,000 sq. ft., was purchased at 4100 Fullerton Avenue, in Chicago; this location is used partly for office space to accommodate sales and merchandising activities, and partly for assembling and shipping.

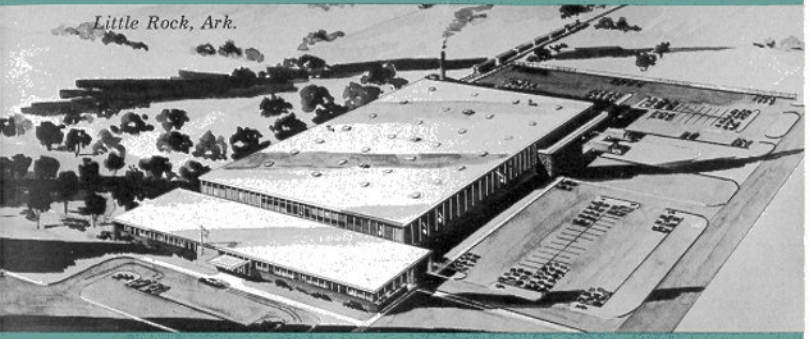
In 1956 Teletype acquired a manufacturing plant with 52,000 sq. ft. adjacent to the original Touhy structure. In addition 236,000 sq. ft. were leased in four Chicago locations, and considerable manufacture was subcontracted. New and greatly enlarged quarters were also leased for the Teletype School of Maintenance Training, at 201 N. Wells Street, Chicago.

With a view to the future, Teletype early in 1957 purchased a tract of land at the Touhy location on which three buildings are to be erected - a manufacturing unit. an administration building, and a development and research center. Construction of the manufacturing unit, with 500,000 sq. ft., was begun immediately. Eventually the Touhy location will replace Wrightwood as Teletype Corporation's headquarters.

To obtain the advantages of a second geographical location, a 160 acre site was acquired in Little Rock, Arkansas, in the spring of 1957. Pilot operations in leased quarters are already under way. Later a 400,000 sq. ft. building is planned. The Little Rock location will be a completely autonomous manufacturing unit, from the purchase of raw material through machining, assembly, and merchandising.

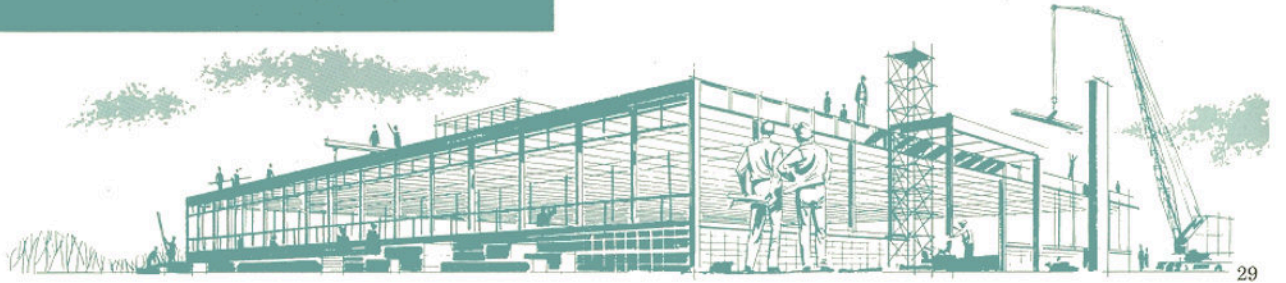
5701 Touhy Avenue

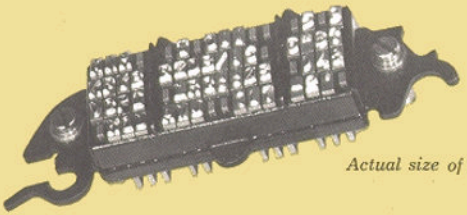
Little Rock, Ark.



5757 Touhy Avenue

4100 Fullerton Avenue





Actual size of the Model 28 printer typebox.

MOVING TOO FAST FOR EITHER THE EYE OR THE CAMERA SHUTTER, THE TYPE BOX OF THE MODEL 28 PRINTER SPEEDS AT 100 WORDS PER MINUTE.

NEW EQUIPMENT FOR A NEW ERA

Invention, research, development..... these have always been stressed at Teletype. Thus the company undertook the development of an entirely new line of equipment - the Model 28. The apparatus was to be like nothing ever seen in the printing telegraph field.

It was to run at 100 words per minute with less maintenance than required by conventional equipment at 60 words per minute - and at the same time it must be quieter in operation and lighter in weight. It was to have provision for incorporating extra features and remote controls on a scale hitherto undreamed of. It must take in its stride environmental handicaps such as arctic cold and tropical heat, as well as the shock, vibration, and non-level positions inherent in operating aboard moving vehicles.

Finally, it was to be designed on the "building block" principle, to permit maximum interchange of parts, mechanisms, and units. Thus it would combine the benefits of manufacture by quantity production methods with a broad scope for meeting the often highly specialized requirements of the individual user.

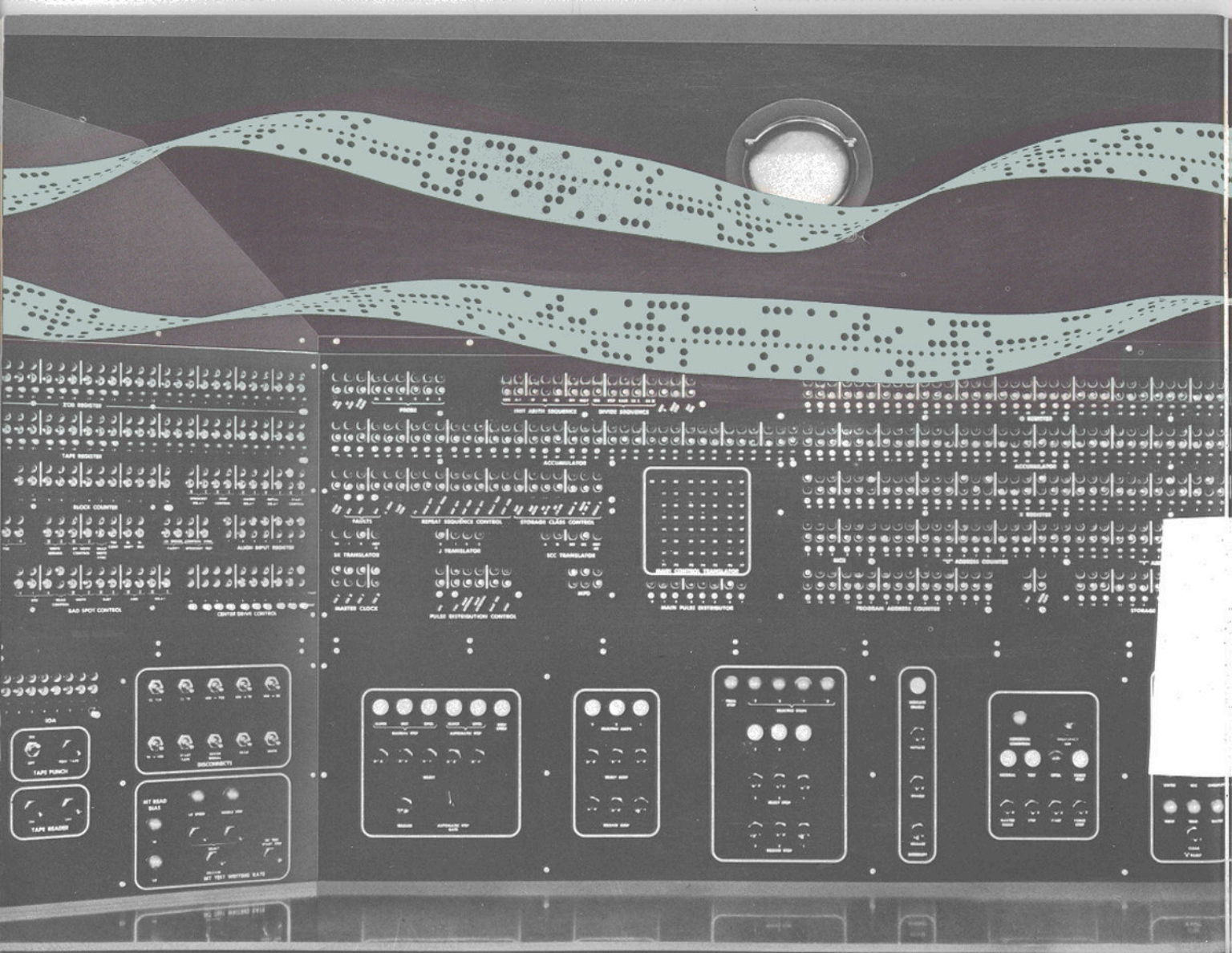
This "blue print" was actually conceived prior to World War II, but work began in earnest at war's end. Naturally, many problems were encountered in designing a printer to so demanding a set of performance specifications, but one by one these were solved. After a succession of models, laboratory tests, and extensive field trials, the first lot of the new Model 28 page printers was ready late in 1950. Urgent needs of the Armed Forces in the Korean crisis were given priority, and it was not until 1953 that the machine was available to the general public.

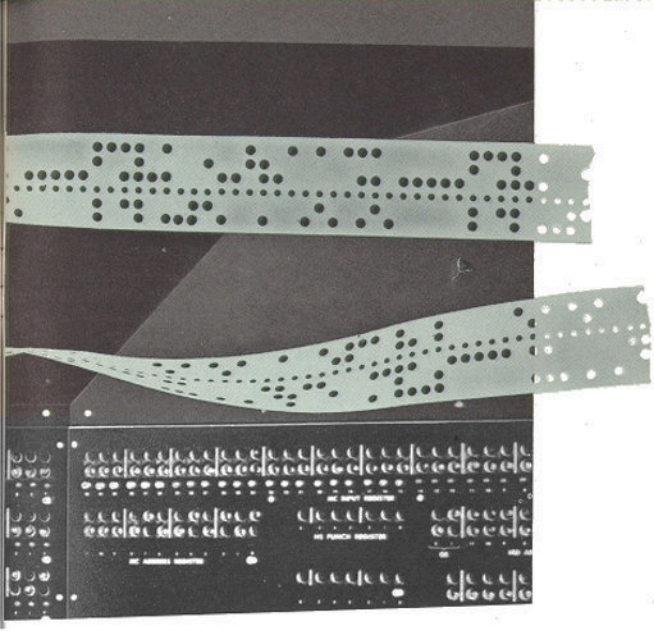
In looking at the new printer, perhaps the most striking feature is the replacement of the usual bulky type-basket with a miniature carriage consisting of a 1" x 3" type-box and a tiny print hammer. Internally, there are other innovations. The machine has no structural castings; side frames and base plate are resilient sheet metal. Speed and quiet operation are built in, not only with light-weight parts but with the principle of harmonic motions - so that the machine runs more smoothly and easily at 100 words per minute than conventional designs at slower speeds. Clutches are all-metal and call for oiling once or twice a year, in contrast to two weeks for felt clutches.

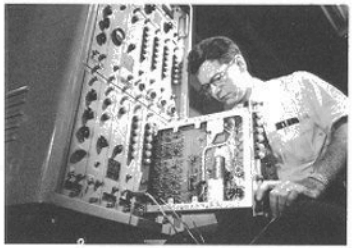
Of exceptional interest is the provision for extra features and remote controls. This is handled through a mechanism called the "stunt box" ("stunt" being an old printing telegraph designation for non-typing functions). In effect a built-in sequential selector, this 9¼" ," x 4½" unit has slots which can be equipped with trains of miniature parts or switches to perform an almost unlimited array of tasks.

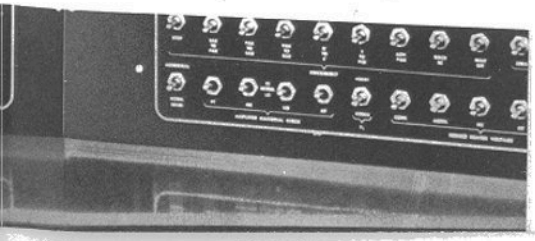
The "building block" principle can best be illustrated in the new composite set, the Model 28-ASR, introduced in 1957. Innumerable variations are possible in the basic combination of send-receive page printer, tape punch, and tape reader to fit the requirements of the individual user.

Thus the Model 28 line is more versatile and more flexible than any printing telegraph equipment hitherto made. It is geared for today's increasingly complex needs, with built-in provision for new demands which tomorrow is certain to bring.


TAPE REGISTER
BLOCK COUNTER
AUDIO INPUT REGISTER
BAD SPOT CONTROL
CENTER DRIVE CONTROL
PHASE
FAULTS
REPEAT SEQUENCE CONTROL
STORAGE CLASS CONTROL
ACCUMULATOR
MASTER CLOCK
PULSE DISTRIBUTION CONTROL
MAIN PULSE DISTRIBUTOR
PROGRAM ADDRESS COUNTER
STORAGE
TAPE PUNCH
TAPE READER
DISCONNECT







A LOOK AHEAD

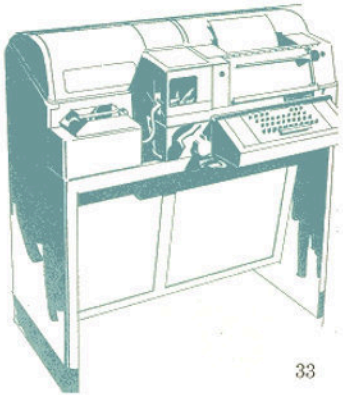
What of the future? Throughout its history, Teletype has constantly widened communications horizons. Today the possibilities and variations for new applications of Teletype equipment appear to be almost limitless. A period is now developing which future historians may compare to the onset of the Industrial Revolution, and such periods inevitably bring changes in accustomed practices.

RECORD AND DATA PROCESSING - The field of office work, record keeping, and data processing is one in which change is already beginning to take place on a sizeable scale. There are a number of reasons for this.

In the first place, there is the development of the complex and vastly ingenious computing machines which can accomplish in a few seconds data processing operations that would otherwise require thousands of skilled man hours. Second, many organizations are expanding to the point where time, cost, and control considerations make rapid processing of record data absolutely vital. Finally, there is the sheer mass of paperwork in which we are all engulfed, with the ratio of paper-handling effort to production effort rising steadily.

Thus we find change entering the office under such names as automation, automated data processing, electronic data processing, and integrated data processing. Of these, the last, usually referred to as "IDP," is probably best known. The general objectives of these various systems are (a) to eliminate duplication of typing effort by providing for automatic reproduction of repetitively used information (as in order, invoice, shipping label, and inventory entry); (b) to transmit the required portions of the information quickly and simultaneously to all departments and locations involved; (c) to provide up-to-the-minute records in all areas of the business for the guidance of management.

Teletype equipment enters into such systems not only as a communication instrument to transmit information instantaneously wherever it is needed, but also to provide and



reproduce punched tape and to type on forms. Much of this is on a "by-product" basis.

The office revolution is leading to a further trend, that of geographically centralized accounting systems for large organizations. Here, computers handle the heavy paperwork jobs such as payrolls, statements, dividend payments, and freight car accounting, with Teletype communication networks to carry information to and from the outlying points.

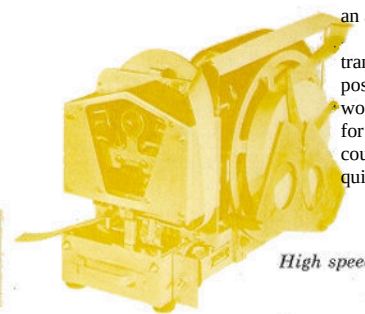
It is likely that in the future small businesses will enjoy similar advantages through independent computer services, or perhaps by banding together cooperatively or through their trade associations- with private wire or TWX networks providing a swift highway for the data.

FACTORY AUTOMATION - Many new and ingenious developments in the field of factory automation can be expected in the coming years. Where such automation setups are based on perforated tape controls, Teletype equipment is available for tape preparation and tape "reading."

Control codes in tape can direct the positioning of machine tools through a series of operations - and can do this with pinpoint accuracy. Control codes can also "decide" which of a variety of possible sizes, shapes, and patterns the machine shall make, as well as the quantity to be produced.

This suggests that for many products the manufacturers' inventory problem may ultimately be solved by stocking only raw material and punched tapes, to turn out goods as needed at high speeds. Reduction of small lot costs will be an added benefit of such a system.

HIGH SPEED TAPE TRANSMISSION - High transmission speeds from punched tape for specialized purposes are the subject of increasing attention. Teletype's 600 word per minute system is already in service in one network for moving bulk message traffic between key points across country. High speed capacity in punched tape is also required in connection with certain data processing operations. The next step from 600 words per minute is 1,000 words per minute-already practicable - and much higher speeds are likely in the future.



High speed tape punch.

EQUIPMENT DESIGN - One of the most important influences on current design of electronic equipment of all kinds is the transistor, invented at the Bell Telephone Laboratories. Teletype IRIS put this "mighty mite" to work in a transistorized version of its "electronic multiplex," which is used to combine the signals from several communication channels for transmission over a single channel. A comparison of size, weight, and power requirements between the transistorized multiplex and its vacuum-tube predecessor is startling. The new set is about the size of a two-drawer file, with a volume of 10.5 cu. ft., compared to 55 cu. ft. for the previous set; weighs 260 lbs., compared to 1,450 lbs., and draws 50 watts compared to 1,400 watts.

THE STUNT BOX - The stunt box of the Model 28 printer, whose versatility has barely begun to be probed, offers interesting possibilities as a low-cost automatic control instrument. This mechanism has the ability to "ride the line" and watch for specified characters or sequences of characters. When it detects such a control signal, it can throw a lever or a switch-thereby initiating whatever action may have been called for by the signal.

For example, in response to assigned codes in punched tape, it can automatically direct information to certain receiving instruments on a circuit, while withholding portions of the message from others and shutting out still others altogether. In another type of application, such as transmitting orders to warehouses, it can perform both routing and sorting jobs. Thus the information can be fed into the system in a random manner, without being presorted The stunt box will "recognize" area designations punched into the tape and automatically direct the items to receiving machines in the

The highly versatile stunt box.

locations where the specified goods are stored.

The number of locations which could thus be reached is theoretically unlimited and is governed only by the volume of traffic that can be handled from a single control center in a given time span. Since the stunt, box can recognize sequences of control codes as well as single codes, the number of permutations available for a coding system runs into the thousands.

AUTOMATIC REPORTING - When the first Morkrum printer was tested on the Chicago and Alton Railroad in 1908, one of its principal advantages was that, unlike Morse, no operator was required at the receiving end to decode and type out the messages Reception was automatic, or "unattended."

In some fields, we are now entering a phase where transmission as well as reception can be unattended. Thus weather observations could be made and scientific tests conducted in remote and inaccessible geographic areas and in cosmic spaces. Instruments could then translate measurements made by them into telegraph code, for instantaneous transmission and recording on Teletype equipment wherever the data may be desired.

Carrying this principle a step further, we have automatic process control for factories, with instruments initiating, checking and correcting the process as needed--and transmitting a continuous progress report to management on a Teletype printer.

These are but a "sampling" of the many areas in which Teletype equipment can be expected to serve in the years to come. Developments now in the laboratory and testing stages will open many additional fields, meet a host of new needs. Teletype's 50 years of experience in the design and manufacture of printed communications equipment provide a unique back-log of "know-how" to meet the opportunities and challenges of the era of rapid technological progress that lies ahead.

The new Teletype Model 28 ASR

THE TELETYPE FAMILY

Teletype Corporation, like all companies, is a mirror of the men and women whose imagination, skills, and energy translate ideas into products and services. From the first. the company has appreciated that its success must be based on the faith and effort of its people, and the people have in turn taken pride in the company's contributions to the nation in war and peace and the role it has played in the spectacular advance of modern communications.

The welfare of its people both on and off the job is of constant concern to the company. Teletype employees are covered by a comprehensive Benefit Plan. which helps provide for their retirement with a non-contributory pension plan and protects their families with death and sickness benefits. These benefits increase with length of service.

Education is encouraged, with in-service training programs and a tuition-refund plan. The on-the-job program includes such subjects as designer training, tool and die apprenticeship, job grading and supervisory training. The tuition-refund plan allows employees up to $250 per year for college attendance in their free time on an undergraduate or graduate level in broadly job-related courses.

Teletype employees also have opportunities to participate in the various special Western Electric advanced training programs. Some of these are conducted on a cooperative basis with leading universities, such as workshops and seminars to keep engineers abreast of fast-breaking developments in the scientific and technical fields.

In addition, the employee-run Teletype Evening School - which is complete even to its own principal - offers instruction covering such subjects as first aid, shop math, blueprint reading, electricity and basic principles of Teletype equipment and communications.

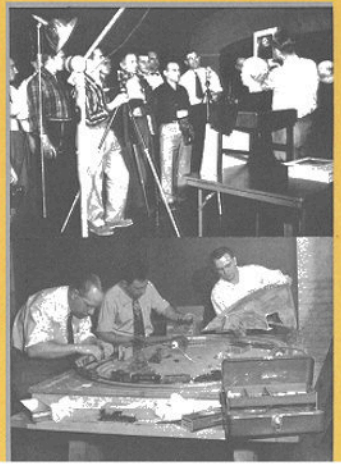
Social and recreational opportunities have been part of the Teletype picture from the earliest days. The original Wright wood site included considerable adjoining land, and employees soon put part of it to good use for tennis and volley ball courts. Also receiving enthusiastic participation in those days was noontime dancing, to the "hot" music of one or another of the ragtime piano practitioners. Beach parties were also good for after work get-togethers, and in the late Twenties long service employees were honored at an annual banquet.

Since 1936, all company "extra curricular" activities have been coordinated under the sponsorship of the Teletype Club, an organization operated and managed exclusively by and for Teletype employers.

Club activities afford everyone an equal opportunity to participate. Sports enthusiasts find pleasure in golf, softball, archery and bowling. Hobbyists, too, find their enjoyment in gardening and camera groups. There are also picnics, square dances, amateur theatricals, concerts and ballet to attend. A Christmas party is given annually for employees' children, with each youngster receiving a gift from Santa Claus.

The culminating event on the Club's annual calendar is the election of the Teletype Queen, designated the "Hi-Telepal" girl. She is chosen by employee ballot the four runners-up becoming her "court" - and is formally crowned at the annual coronation dance.

Teletype's "senior citizens" - those with 21 years or more of service to the Bell System - are eligible for membership in the Telephone Pioneers of America. Here they find rewarding fellowship and the opportunity to remain in touch even after they retire from active service. Teletype employees now have their own Council of some 300 members in the Pioneer organization.



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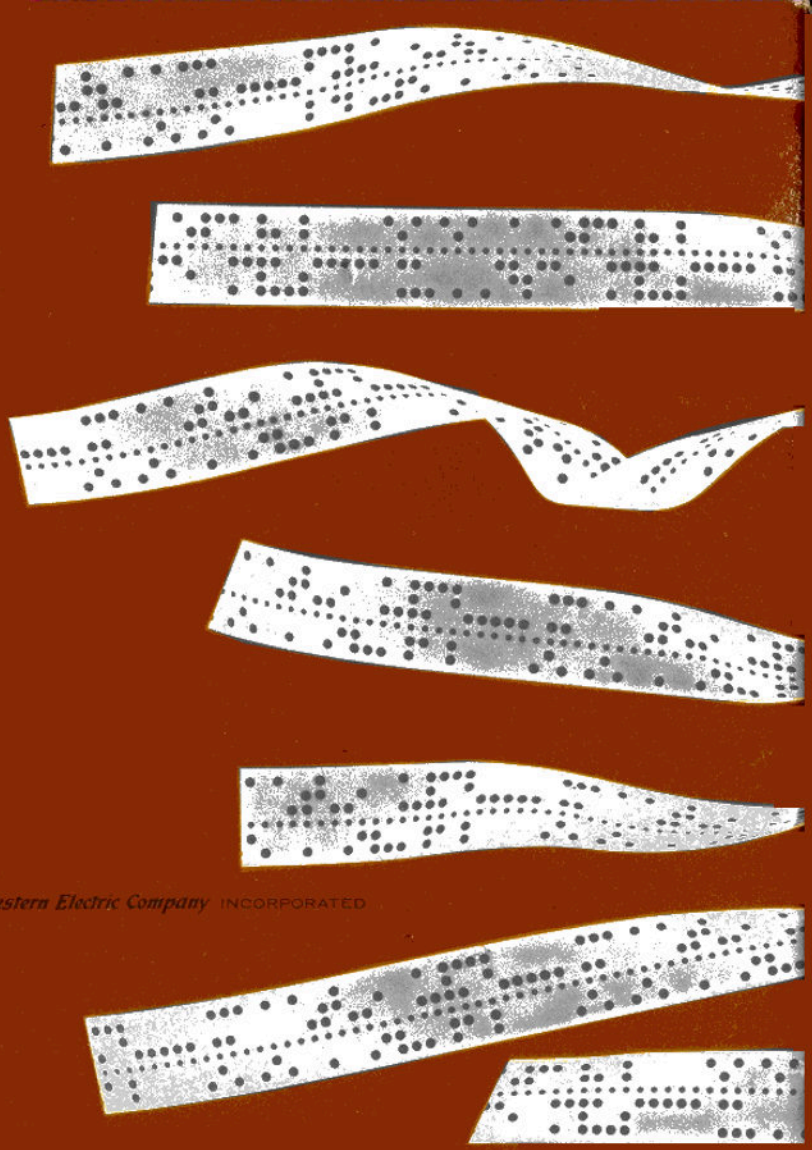

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