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EVOLUTION

OF THE

TYPEWRITER

BY

C. V. ODEN

AUTHOR OF "A TALK ON SALESMANSHIP" AND

"TYPEWRITER COMMENTS AND COMPARISONS"

"Some books are to be tasted, others to be swallowed, and some few to be chewed and digested."

—BACON.

FOREWORD

The contents of this book give the steps in the evolution of the typewriter, and are the result of observation, study, and conviction. The purpose is to answer in as concise form as possible the many inquiries received with reference to the history of the typewriter. However, this book is not to be considered in any sense a history, for the reason that many typewriters have been invented and many marketed that are not mentioned. Those omitted have not, in the author's judgment, contributed either mechanical principles or educational assistance that would promote typewriter development. On the other hand, consideration is given some machines only because they have suggested principles or ideas that have served to assist other manufacturers; and others, from the fact that they received more or less recognition from the public.

Practically unlimited numbers of patents have been issued on typewriters and accessories, but to enumerate them would require volumes, from which it would be difficult to assort and assimilate information of value.

The author gratefully acknowledges having drawn from many sources in the preparation of this work, principal among which are: Patent Records, Office Appliances, Typewriter Topics, Phonographic World, History of the Typewriter, the Franklin Institute, Mr. C. D. Rice, and Mr. Charles E. Smith, author of "A Practical Course in Touch Typewriting."

Having sold the first model of the first practical typewriter, however, the facts contained in this book are based chiefly upon the author's personal experience, gained during a period of more than a third of a century of continuous service in the typewriter business, and he has not hesitated to express facts as he sees them.

THE AUTHOR.


O. N. Olsen

BUSINESS EVOLUTION

The development of the typewriter industry is so closely interwoven with the history of modern progress that it is impossible to separate them. In fact, the typewriter is responsible for much of the remarkable progress of the world during the last four decades. For this reason, a synopsis of its development should be interesting to every intelligent, progressive thinker.

The fundamental purpose of the typewriter is to enable the typist, or operator, to do more and better work with less effort in a given time than can be done with the pen, and the value of the typewriter is measured by the extent to which it increases speed and legibility in making records or preparing messages for delivery.

It would be difficult for the present generation, without reference to history or the experience of others, to comprehend the evolution in social, educational, industrial, and commercial progress during the last half century. The telegraph, the telephone, the wireless, the aeroplane, and the wonderful developments in steam and electrical conveyances have brought the nations of the earth into closer communication with each other, and the typewriter has become an absolute necessity for the preservation of the records of such communication.

Telegraph and telephone messages must be confirmed in writing for future reference and record to avoid mis-

understanding, and this easy means of communication has greatly stimulated the development of transportation. As evidence of these facts there is no business interest worthy of note today that has not from one to many thousand typewriters in use. For example, the Western Union Telegraph Company, whose mission it is to give the best possible service, both in speed and accuracy, in the receipt and delivery of messages, purchased in a single order ten thousand Underwood typewriters, and a repeat order for several thousand indicates satisfactory service.

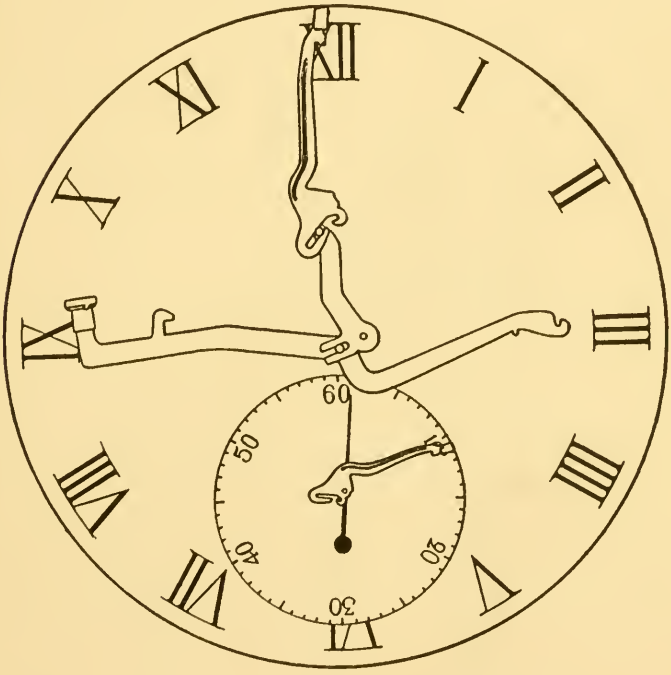
The development of communication in its various stages, with the express purpose of saving time, is interesting. In the days of King Henry VIII, before the telegraph, the telephone, and the typewriter, official communications were transmitted by messenger with instructions to "Haste, post Haste! Haste for thy life!", and the penalty on account of delay was death. Hence it will be seen that the proper appreciation of the value of time has been, and is, the foundation of progress. The penalty for delay or the waste of time now, as then, is death; not, however, to the individual but to his business.

The typewriter has revolutionized commercial methods. It lessens labor, at the same time increases it. It has supplanted the pen in commercial correspondence, because it has greater speed, accuracy, and legibility. It magnifies and intensifies mistakes in spelling, punctuation, and capitalization, and as a result, leads to their correction. It stimulates accuracy by encouraging greater attention to detail, both on the part of the dictator and the typist. The typewriter has done more to promote the phenomenal business expansion during recent years than any other office appliance. Indeed, it has made most of the modern office appliances necessary, as well as possible.

The typewriter has developed the ability and increased the capacity of the business man, the professional man—

the thinking man in all lines of endeavor—to deliver his message. In fact, every man who contributes to the progress of the world, or who promotes its social, industrial, and commercial interests in any way, through communication with his fellow man, is benefited by the typewriter.

Today it is possible to record thought almost as rapidly as it formulates, and the busy business man can dictate



MEASURING TIME

As compared with the second-hand of the watch the typebar of the typewriter moves eleven times faster. This was demonstrated by Miss Margaret B. Owen, in actual work, in winning the World's Typewriting Championship. Miss Owen struck the keys more than eleven strokes a second for three thousand six hundred consecutive seconds.

more in one hour than he could formerly write in a whole day's time. In fact, in the days of the pen-written letter it was necessary to sacrifice clearness and exactness of thought and expression in order to conserve time and labor. Today the typewriter has released the business man from these restrictions and limitations, and has given him a mental freedom that enables him to produce the highest and most efficient results. The typewriter provides facilities which enable the business man to think quicker and better, and being relieved of the physical labor in recording his thoughts, he has much more time to devote to the development of new ideas in the expansion of his business.

It was Bacon who said "Reading maketh a full man, conference a ready man, and writing an exact man."

TYPEWRITER EVOLUTION

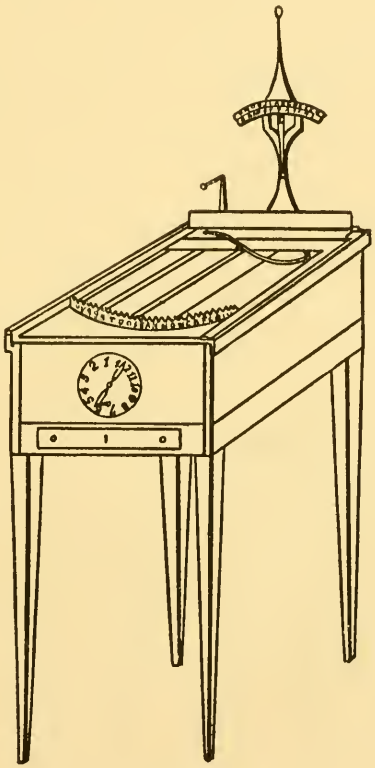
Authentic records show that the germ of typewriter genius first manifested itself more than two hundred years ago when in the year 1714 Henry Mill, an English engineer, patented a writing machine which he said he "had brought to perfection at great paines and expense"; yet it was more than a century and a half thereafter before the first practical typewriter was built, and the development of genius and public opinion began to get together. No model showing the mechanical construction, or descriptive matter concerning the principle involved in this machine, is available.

However, during the period between the first recorded idea and the first practical results of a writing machine, many futile efforts were made to produce a commercially practicable machine, as the following steps show.

In 1784 an embossing machine was invented in France for the benefit of the blind. It served its purpose in the process of evolution, as all intermediate efforts did, but its

scope was limited quite as much as its practicability, and as a result it received no commercial recognition.

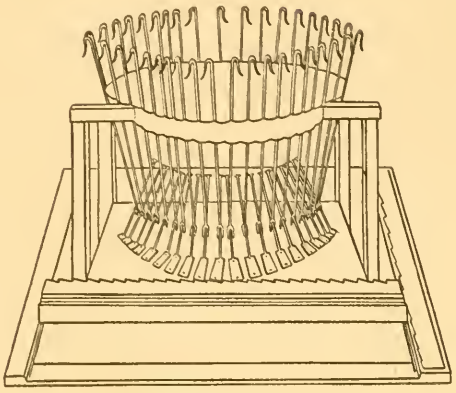
In 1829 Mr. Burt, of Detroit, Mich., invented and patented a machine which he called a "typographer." The merits of this invention were of such minor importance that the machine made little impression upon the business world. Unfortunately, all original descriptive matter, records, etc., concerning this machine were destroyed by a fire in the Patent Office at Washington in 1836. Only the original drawing, presented herewith, was preserved.



BURT

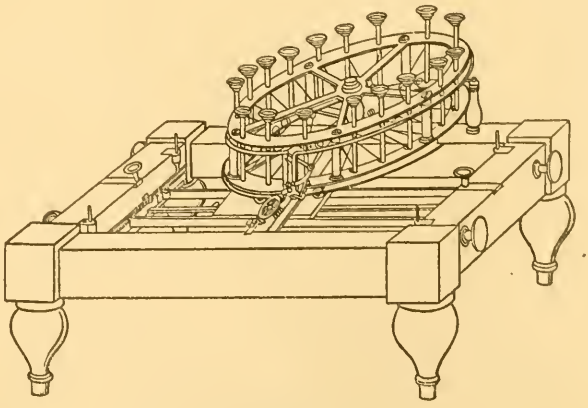
In 1830 M. X. Progin, Marseilles, France, took out patent papers for a machine which he called a "typographic machine or pen." It embodied the first principles, though

crudely, of the typebar idea. In 1836 another French machine was brought out with no greater success. The following is a diagram showing the typebars of Progin's machine.



PROGIN
THE FIRST IDEA OF A TYPEBAR

In 1843-5 Charles Thurber, of Worcester, Mass., built a machine that did actual work. This was a type-wheel machine, and it suggested the first principle of the movable carriage. It was very slow; its principle and construction were crude; and the business public was not enlightened concerning the value of a writing machine, hence its failure.

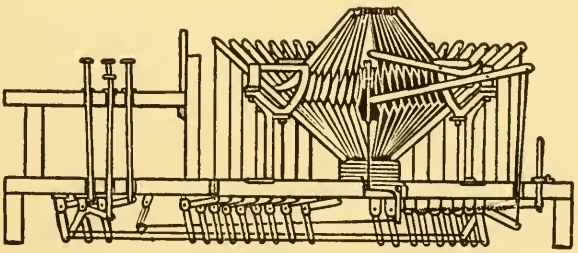


THURBER
THE FIRST MOVABLE CARRIAGE

In 1844 a man by name of Littledale, an Englishman, invented an embossing machine for the blind. In this machine provision was also made for the use of carbon, which was inserted in the usual way, and while writing an embossed copy for the blind, a carbon impression was also made for those less unfortunate.

In 1845 a machine was brought out by Dr. Leavitt, of Kentucky. There is no evidence that this machine was practical and it evidently was not, from the fact that it soon passed out of existence.

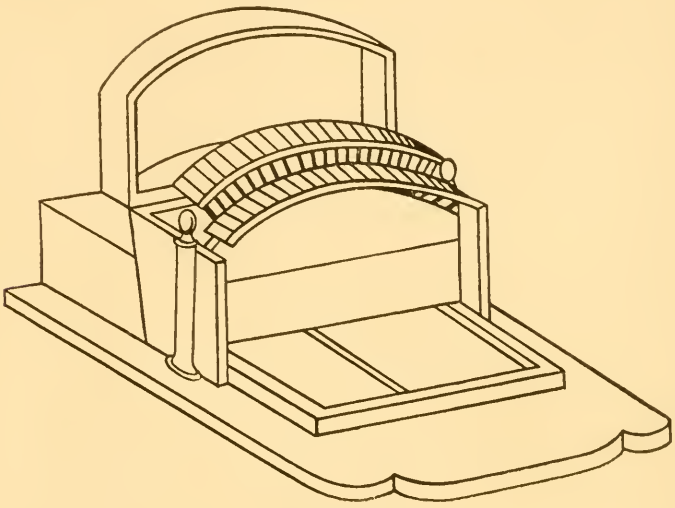
During the intervening years, 1847-56, a number of models of a machine was invented by Alfred E. Beach, an American, editor of the *Scientific American*. From this machine we get the first idea of the "key stem" or finger key, bell crank, connecting wire, and universal bar principle. The typebars also converged to a common center. However, the purpose of this machine was not for typewriting as it is understood today; the invention was intended only for making embossed impressions on a narrow tape. The following illustration shows a section of Beach's machine, and the application of his advanced ideas.



BEACH
EMBODYING MANY NEW IDEAS.

In 1848 a machine was invented by Fairbank, not, however, with the view of typewriting, but to print designs in colors on calico or fabric. This machine was patented for "printing purposes," which is the only reason why it is given place here.

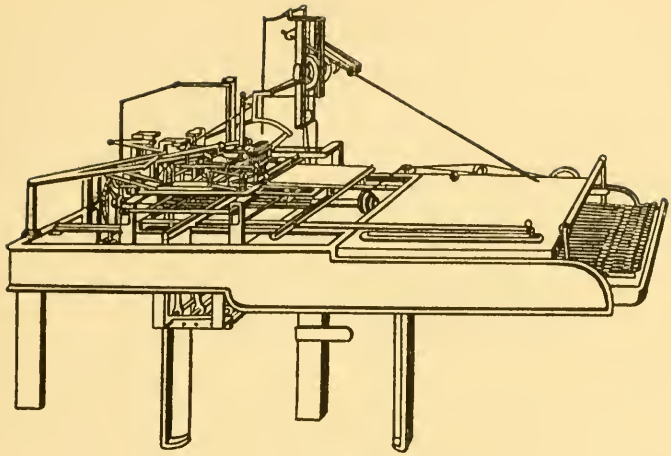
In 1849 Pierre Foucauld, a blind man, invented a machine for those similarly affected. This machine was exhibited in Paris, where it attracted considerable attention and was awarded a Gold Medal. A number of the machines was manufactured, but the purpose for which it was intended necessarily limited the demand; as a result its success was of short duration.



FOUCAULD

In 1850 a machine was invented by Mr. Eddy. It had seventy-eight type arranged in six rows of thirteen each. This was in reality a typewriter, but for reasons which records do not explain, the machine did not get beyond the experimental stage.

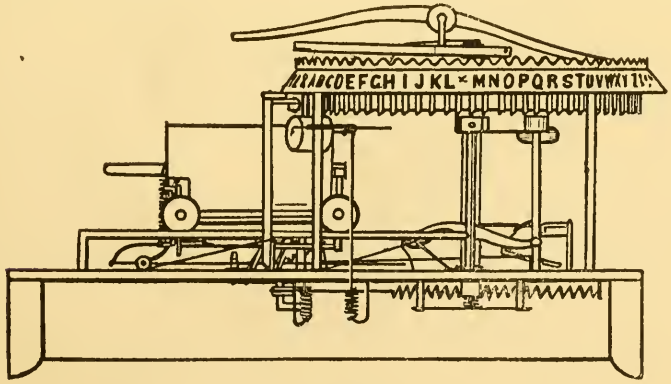
In 1850-1 Sir Charles Wheatstone, considered one of the greatest scientists and inventors of his day, was experimenting with a machine for the purpose of recording the messages from his dial telegraph, another of his inventions. This machine possessed very little merit, and while records show that Sir Charles made further attempts between 1855 and 1860, none of his efforts possessed sufficient merit to do credit to his reputation as an inventor.



EDDY

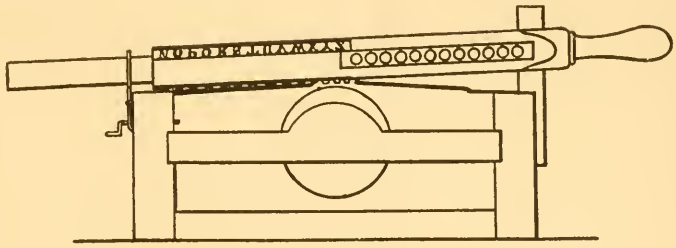
At about this period a machine was brought out by Marchesi and another by a Mr. Hughes. The latter machine was the more effective of the two, but it went the way of the many, serving only the purpose of those who fail in their efforts through honest endeavor, leaving an experience by which others may profit.

In 1852 patents were issued to John Jones, of Clyde, New York, for a writing machine, called a "Mechanical Typographer," and although the inventor had the benefit of former experiments, his machine lacked practical value and failed to produce the desired results.



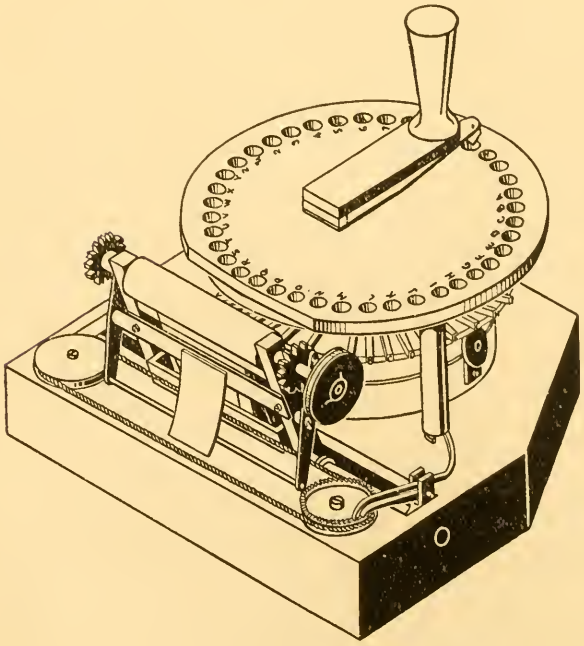
JONES

In 1854 Thomas, an American, invented a machine of such little value, except to suggest a locking device for the type-wheel machines of a later day, that it is hardly entitled to space here. It consisted chiefly of characters carved on a rolling pin, with other equally crude ideas.



THOMAS
EMBODYING FIRST TYPE-LOCKING DEVICE.

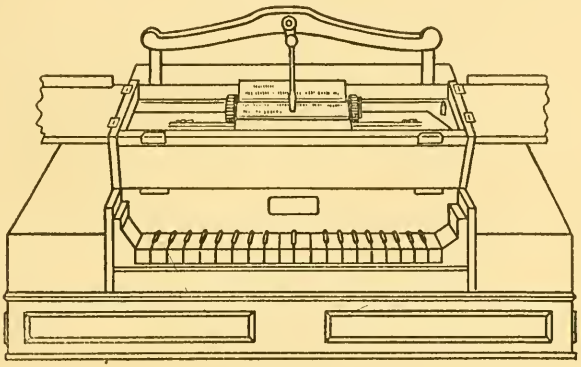
However, since it embodied an idea that was used by later and more successful inventors, it has been recognized.



COOPER

In 1856 a machine was invented by Cooper that had a type-wheel acting on a vertical axis. This anticipated very closely the invention of Mr. Hammond, which has met with such success that it still has some considerable following.

In 1857 Dr. William Francis, of New York, made an unsuccessful attempt to build a typewriter. The machine was a failure because the typebar action was so complicated and heavy; nevertheless it embodied features from which later inventors have profited, among which was the principle of the type-guide.

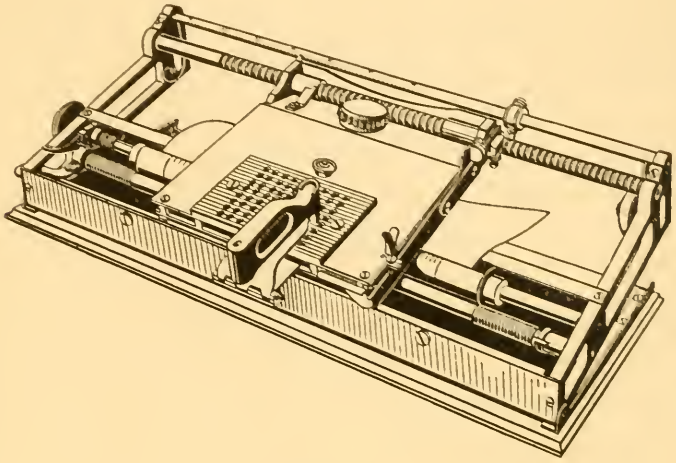


FRANCIS
EMPLOYED FIRST PRINCIPLE OF TYPE-GUIDE

In 1861-7 Thomas Hall, of New York, invented and constructed a typebar machine. This machine embodied many of the essential features of the writing machines in use today, but it was never offered for sale. Mr. Hall later directed his attention to the construction of a machine, which he did place on the market in about the year 1880. This machine was known as the Hall typewriter, and embodied the pantograph principle, operated with one hand by means of a stylus. This machine could be worked at a surprising speed, considering the one-hand method by which it was necessary to operate it.

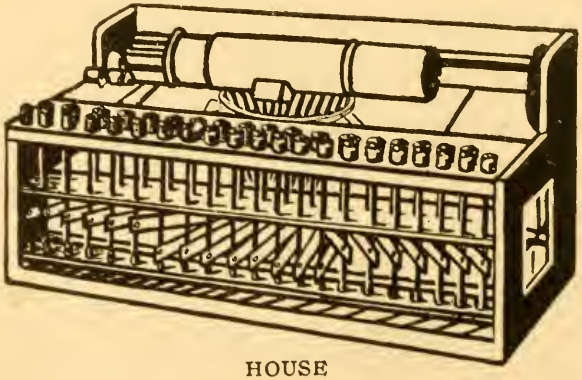
A number of these machines were manufactured at a profit, it is said. If this is true, the Hall was doubtless

the first typewriter to reach this point of progress. The one-hand stylus principle, however, was wrong; its operation was slow, and as a result the machine was soon succeeded by others that embodied principles which contributed to greater speed and accuracy, many of which are in use today.



HALL
STYLOGRAPHIC MACHINE

In 1865 George House, of Buffalo, New York, brought out a machine in which the type were arranged in a basket, striking the paper at a common center. By reason of this fact his machine marked a distinct step in the development



HOUSE

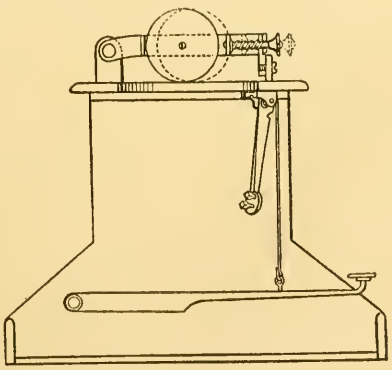
of typewriter genius, but its value consisted solely in its contribution to other inventors.

In 1868 John Pratt, of Alabama, was fortunate in bringing out a machine at about the time the press had become greatly interested in the efforts to produce a typewriter. The London papers commented upon the feasibility and the value of a machine which would produce writing by mechanical means. The *Scientific American,* commenting directly upon Mr. Pratt's production, refers to it as follows:

"It is assumed that a man may print his thoughts twice as fast as he can write them, and with the advantage of the legibility, compactness, and neatness of print . . . The subject of typewriting is one of the interesting aspects of the near future. Its manifest feasibility and advantage indicate that the laborious and unsatisfactory performance of the pen must, sooner or later, become obsolete for general purposes."

The *Phonographic World* later published an article describing Mr. Pratt's machine in detail.

Mr. Pratt's machine was soon numbered among the many failures that had preceded it. However, he took out patents on another machine in 1882, which he sold to James B. Hammond, who incorporated them in a machine which will receive due mention.



BROOKS

FIRST IDEA OF TWO CHARACTERS ON EACH TYPEBAR

Byron A. Brooks, who had rendered extensive service in the development of typewriters, promoted the first principle of placing two characters on each typebar; this necessitated a lower and an upper case which was operated by a shift key, a principle employed in the most popular typewriters of today.

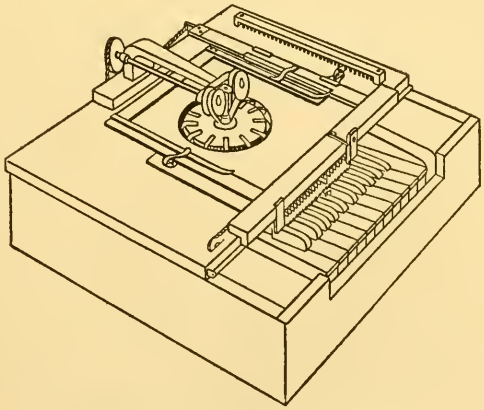
Mr. Brooks later invented a machine to which he gave his name, and as an indication of his far-sighted knowledge of the ultimate demands of the typewriter industry, he attempted to produce visible writing. But his efforts in this direction were unsatisfactory because only two lines of writing were visible at one time. They did, however, serve as suggestions to assist later inventors. The typebars stood up back of the platen and struck forward and downward. The machine had no special features to commend it to public opinion, and as a result its manufacture was soon discontinued.

The foregoing were experimental steps in the progress or evolution of ideas in the development of the typewriter. These experiments were being conducted on both sides of the Atlantic. In fact, it might appear that there was a contest for priority in the production of the first practical writing machine, in which America won, as subsequent developments will show . Although all these steps were failures, so far as individual practical results were concerned, they were valuable to succeeding inventors who culled and preserved the practical and eliminated the impractical.

For example: M. X. Progin, in 1830, advanced the first principle of the typebar. From Charles Thurber we get the first idea of a movable carriage, embodied in his patents of 1843-5. To Alfred E. Beach we are indebted for the first ideas of the finger key, bell crank, connecting wire, and universal bar, also the converging of the typebars toward a common center. Thomas is credited with the first

idea concerning a locking device. The machine invented by Cooper in 1856 gives the first type-wheel device acting on a vertical axis. Dr. Wm. Francis originated the type-guide. From the invention of George House, of Buffalo, we get the first idea of arranging the type in a basket. And to Byron A. Brooks is given credit for placing two characters on each key—an upper and lower case—which necessitated a shift key for capitals and other upper case characters.

About the year 1865, C. Latham Sholes, a printer in Milwaukee, began experimenting with a machine for inserting the numbers of pages in books. This machine attained such a marked degree of success that Mr. Sholes, having studied the comments of influential mechanical experts in magazines concerning the universal and practical demand for a typewriter, and believing in its possibility, became interested in extending his ideas to the development of a writing machine. With this object in view, in 1867 he associated with himself Carlos Glidden and Samuel W. Soulé. In 1868 they were granted patent papers for a machine, which although very crude, embodied such practi-



SHOLES, GLIDDEN AND SOULE'S
EARLY EFFORT SHOWING PIANOFORTE KEYBOARD.

cal ideas that it attracted the attention of James Densmore, a wealthy inventor of Meadville, Pa., who, upon paying

all of the expenses incurred in all previous experiments, secured one-fourth interest in the invention. Soon after, Glidden and Soulé dropped out of the enterprise.

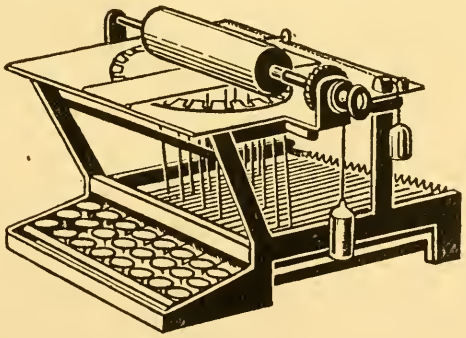
Mr. Densmore first saw the machine in 1868, and immediately pronounced it a failure in its state of development at that time, at least so far as its practicability was concerned. However, he believed that the ideas and principles of the machine were correct, and at once began the process of elimination and development. Many models were made, all of which were rejected as impractical after having been thoroughly tested by those who were in a position to understand the requirements of a practical writing machine. These numerous failures discouraged Mr. Sholes, but he was urged by Mr. Densmore to continue his experiments. Mr. Densmore insisted that it was absolutely necessary to the ultimate success of the machine to have interested outsiders point out the defects and suggest wherein the machine might be improved. Owing to the most limited manufacturing facilities at their command, these machines were so extremely crude in workmanship that they contained little suggestion of the possibilities of the present-day typewriter. It was not until the year 1870 that the machine began to give promise of real service. The actual value of the machine up to this time, however, consisted chiefly in confirming the confidence of its inventors.

About this time G. W. N. Yost became interested in the enterprise, and suggested further alterations and improvements. Mr. Yost's efforts, however, were most effective through his influence in convincing his associates that the machine must be made in the most skilful manner, if it was ever to attain a high degree of profitable service. With this object in view, Mr. Sholes, Mr. Densmore, Mr. Yost, and others, sought and secured the attention and interest of E. Remington & Sons (the Remington Arms Company), of Ilion, New York. This company had attained quite an extensive reputation for mechanical skill through

the manufacture of firearms during the late Civil War, and was doubtless better equipped for the quality of work necessary to build a serviceable typewriter than any other company at that time. The first machine, therefore, that would really do practical writing was due to the original ideas of Mr. Sholes, the judgment and perseverance of Mr. Densmore, and the influence of Mr. Yost.

To Mr. Sholes is also due the arrangement of the keyboard. He was a printer by profession, and it has been said that the order of the printers' case evidently suggested the arrangement of many of the seventy-six characters on the original machine. Although some minor changes have been made, the present keyboard is substantially the same as the original. There are many who feel that a revised keyboard would be beneficial, and efforts have been made to produce one more satisfactory to all. These attempts, however, have always proved an expensive undertaking without satisfactory results, because time has made the present keyboard practically universal, a fact for which the typist is largely responsible.

A contract was given to E. Remington & Sons for the manufacture of a thousand machines, then known as the Sholes and Glidden typewriter.

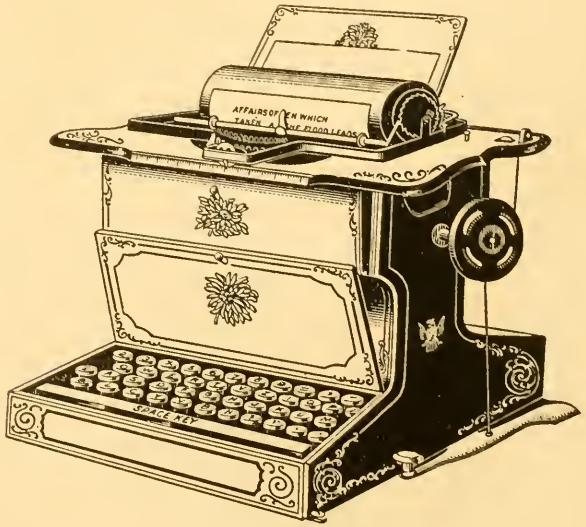


SHOLES AND GLIDDEN
SHOWING LATER MODEL OF DEVELOPMENT

It conveys little information to reproduce the preceding diagrams of the earlier efforts in typewriter construction, as they would hardly be recognized as typewriters. Their only value consisted in contributing to the steps in the evolution of the typewriter by way of suggestion. E. Remington & Sons later secured control of the machine and gave the name "Remington."

REMINGTON

In 1874 the first No. 1 model Remington was placed on the market, of which about 400 were sold. Many of these machines were returned, not only on account of imperfections they developed, but because the business world had not yet given the typewriter serious consideration.



FIRST REMINGTON
NO. 1 MODEL

The Western Electric Company became the first sales agent for the Remington, but their efforts were not successful and the agency was transferred to the Fairbanks Scale Company in 1878. The Scale Company met with

no greater success than the Western Electric Company, for the reason as stated before, the public were not educated to the value of a typewriter, and the efforts of the agencies were otherwise more profitably directed.

It may be of interest to know that about this time a legal *sham battle* between typewriter inventors was instigated for the purpose of directing public attention to the importance the typewriter had gained in the commercial world, in which suits and countersuits were brought, all of which were settled out of court "by agreement of counsel." The suits were only intended to agitate an interest in the typewriter, which had not thus far been very successful.

In 1882, the firm of Wyckoff, Seamans & Benedict was organized for the purpose of devoting its entire time and energy to the sale of the machine. The firm consisted of W. O. Wyckoff, a Court Reporter of Ithaca, N. Y.; C. W. Seamans, who had been Sales Manager of the machine for Fairbanks and E. Remington & Sons since the machine was placed on the market, and H. H. Benedict, who had long been associated with the Remington Arms Company.

The next step necessary in the evolution of the typewriter was the education of the public to its commercial value. This was no small undertaking because of custom and prejudice. A typewritten letter often offended the recipient, who seemed to feel that it was a reflection upon his intelligence and ability to read pen writing. For a number of years the typewriter was looked upon as a luxury used only by those who had sufficient money to satisfy a whim; later it became a convenience, and finally an absolute necessity.

The campaign of education which Mr. Seamans had inaugurated during his former association with E. Remington & Sons was continued by the new firm. They believed

so thoroughly in the future of the machine that their idea was, if the business man did not appreciate the value of the machine it should be taken to him, and he should be taught its use and value. With this end in view, several hundred machines were placed in the offices of many prominent individuals and firms, such as editors, authors, lawyers, and manufacturing concerns, with the result that the firm's confidence was confirmed by the unqualified endorsements of all who had been thus favored.

Some of the endorsements secured by Mr. Seamans, a few of which are quoted below, were used by the new firm as a foundation for the further education of the public.

"Hartford, March 19, 1875.

Gentlemen:

Please do not use my name in any way. Please do not even divulge the fact that I own a machine. I have entirely stopped using the Type-Writer for the reason that I never could write a letter with it to anybody, without receiving a request by return mail that I should not only describe the machine but state what progress I had made in the use of it, etc., etc. I do not like to write letters, and so I do not want people to know that I own this curiosity-breeding little joker.

Yours truly,

Samuel L. Clemens."

(Mark Twain)

"Boston, March 17, 1875.

Gentlemen:

I have had one of your Type-Writers for the last ten days, and during this time I have written with it one hundred pages of a story for the magazine under my charge, all of the editorial matter for the current number of this publication, and a great many letters; in fact, I have not used a pen since the machine came into my possession. After this experience of ten days, I find that I can write, with this apparatus, about two-thirds as fast as I can with a pen; and though I

am a rapid writer, I confidently expect to be able to put more words on paper, before many weeks, with this machine, than I ever could with a pen in the same time. Writing with it is a very pleasant occupation, while to me the use of the pen is the merest drudgery. I find no difficulty in 'composing' or doing any of my regular literary or editorial work with the Type-Writer.

Very truly yours,

WILLIAM T. ADAMS,

Editor of *Oliver Optic's Magazine.*"

"PHENIX, R. I., March 28, 1875.

GENTLEMEN:

We have now had the Type-Writer about a month, and are entirely satisfied with it. There can be no doubt in regard to its usefulness. When I saw the advertisement of the machine originally, I had little faith in it. An examination surprised me, but not so much as the practical working has. We have no trouble whatever with it, and it is almost constantly in operation. I think that it must rank with the great beneficial inventions of the century.

Very truly yours,

HENRY HOWARD,

Governor of Rhode Island."

It may be well to direct attention to a condition which seemed to be absolutely necessary at that time in order to break down the prejudice which seemed to prevail against the "printed" letter. The placing of these machines "on trial" in business offices, to demonstrate their commercial convenience, established the "trial habit" which manufacturers have tried for years in vain to eliminate. The "trial habit" is wholly unnecessary and is an expensive imposition which the public inflict upon the manufacturers, but it proves how tenaciously habit will cling. All of the older machines have been "tried" by millions, and it would seem today that a thorough demonstration and comparison of the

relative merits of the various machines as adapted to the buyer's business should be sufficient.

The interests of E. Remington & Sons were so extensive and varied and the success of the new firm Wyckoff, Seamans & Benedict had been so marked that in 1886 the latter purchased from the Remington firm all franchises, patents, plant, etc., used in the typewriter manufacture, and started a separate manufacturing company. Thus the typewriter became an independent enterprise and its success assured.

Thus far in these steps an effort has been made to place the various attempts to produce a typewriter in chronological order. At about this period, however, so many inventors sought to improve the primitive ideas employed in the first Remington production, as well as to share in the profits, that a number of machines were placed upon the market almost simultaneously. Numerous inventors were engaged on various machines at the same time, whose products made their appearance so close together that it would be practically impossible to give them chronological preference.

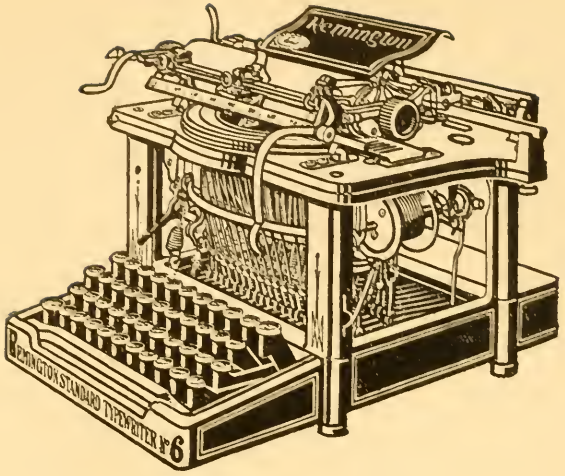
One of the difficult problems with which inventors were confronted at that time was the fact that manufacturing facilities were limited. At least, these facilities had not been brought to that state of perfection necessary to build a typewriter with the essential mechanical accuracy and with sufficient speed and exactness of alignment and operation in all of its working parts to insure durability. Those whose experience dates back to the first typewriter understand the limitations of mechanical facilities at that time, and they know that the progress in manufacturing has made possible refinements necessary to the evolution of the typewriter.

The characteristic features of the Sholes-Glidden product, refined and improved by the Remington Company, rep-

resented the simplest and most effective form of construction at that time. The first No. 1 Remington was a typebar machine. The typebars hung in a circle and were attached to finger key levers by connecting wires. When the finger key levers were depressed the corresponding typebars converged to a common center, striking the printing point beneath the platen. The typebars had pivotal bearings and were suspended from U-shaped hangers, held in place by screws. The possible loosening of these screws and the wearing of the pivotal bearings affected the alignment very materially.

The No. 1 model Remington was succeeded by the No. 4, each of which was a single case, non-shift machine; that is, the alphabet was all capitals. The No. 2 was a double case machine, each typebar being provided with two characters. To operate the upper case, it was necessary to use one of the two shift keys with which the machine was provided. The No. 1 and No. 4 keyboards had fourteen less characters than the present keyboard. The No. 3 model Remington was a wide carriage machine with eight more characters than the No. 2 for special work. The No. 5 model had a similar keyboard, but the construction and action of the machine were very heavy and as a result met with little success. It reversed the style of operating the escapement mechanism; the rack working in the dogs instead of the dogs working in the rack.

The No. 6 model, which was the most popular blind Remington, was in fact the successor to the No. 2 model, having the same keyboard, but many improvements and refinements. The No. 7 model was the same as the No. 6 with the exception that it had eight more characters, the same as the No. 3 keyboard. The No. 6 and No. 7 Remingtons remained the popular machines for years, in fact until other inventors and manufacturers made it necessary to abandon that style of construction.



REMINGTON No. 6 (BLIND)

The typebars of all the various models of the Remington typewriter, except the No. 1 and No. 4, were provided with two characters; the small letters and a few punctuation marks were in the lower case; the capitals, the majority of the punctuation marks, and all special characters were in the upper case. When operated in its normal position the machine wrote lower case characters, and in order to get upper case characters, it was necessary to use the shift key. For this purpose two shift keys were provided; one in the lower bank or row of keys on the left side, the other in the upper row on the right. These keys being out of line or level with each other prevented a properly balanced hand action, so essential in touch typewriting.

The escapement consisted of a rigid and a loose dog which operated in a rack. Its construction was crude and its action slow because of the carriage friction, and because the universal bar which controlled the escapement was beneath the machine and operated by the finger key levers. The finger key levers were made of wood. These were resilient and provided a light touch, but they were susceptible to climatic conditions; in other words they would

warp, and the spacing was irregular between the finger keys, which was not conducive to accuracy in touch typewriting.

The carriage traveled from right to left, supported by a way-rod in the back and in front by a grooved wheel running on a rod, around which were yoke blocks directly connected with the shift key by means of which the upper case was controlled. The carriage was drawn by a mainspring, and when it approached the end of the writing line a bell gave the signal. This signal was given several spaces before the end of the line, when the carriage was returned by the right hand, at the same time giving new space for the succeeding line. While the whole principle and construction was crude, it was undoubtedly the best machine of that style.

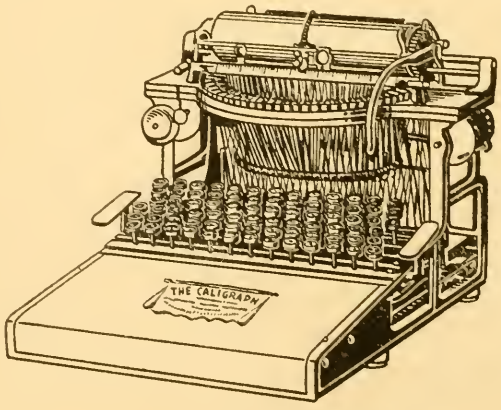
CALIGRAPH

Mr. Yost, having severed his connection with the Remington, began experimenting with a double keyboard machine; that is, a machine embodying a principle which employed a character for each key. Mr. Yost secured the service of Mr. Franz X. Wagner and a Mr. Burn, skilled mechanics who had been connected with the typewriter industry since the original Sholes machine, and were employed at the Remington factory in the later development of the Remington. These experiments resulted in the production of the Caligraph.

The advent of the Caligraph developed a difference of opinion, with reference to the advantages of the single (shift key) and the double keyboard. The principle of a character for each key necessarily made the keyboard very large. The small letters were on white keys in the center of the keyboard, and the capitals arranged on the sides with no regard for order or system. There were two space bars, one on each side of the keyboard.

The Caligraph employed a principle in the movement of the carriage which never became popular. The carriage was not pulled by a mainspring in a spring barrel, but it was moved by a cast metal arm attached to the center of the carriage. This arm derived its power from a long spring encircling an iron bar, running from the front to the back of the machine beneath the finger key levers. The Caligraph also employed the principle of the single dog and the double rack; that is, it had one rigid dog operating in the racks. One of the racks was loose and when a key was depressed, it moved forward the distance of the space of a character, at which point it engaged the dog, which stopped the action of the carriage. This style of construction was not a success, principally on account of the irregular spacing caused by increased friction between the racks.

The Caligraph typebar system had a leverage of the third order. This caused a difference in the depth of the depression of the several banks of keys, resulting in irregular type impressions. At the time of the invention of the Caligraph the process of concaving the type was not known, and to overcome this limitation in manufacturing facilities, the circular platen of the Caligraph consisted of a series of facets which provided a flat surface for each line of writing.



CALIGRAPH
FIRST DOUBLE KEYBOARD MACHINE.

The principles employed in the typebar and the carriage return were very similar to those employed by the Remington. This machine proved a strong competitor of the Remington for a number of years, and will be referred to again in the course of these steps.

HAMMOND

Mr. James B. Hammond, a young man possessed of unusual ingenuity, conceived the idea of building a typewriter long before he had ever seen or heard of the Sholes-Glidden efforts. He employed an entirely different principle, however, namely, the type-wheel. When he saw a model of the Sholes-Glidden typewriter and reviewed their patent claims, it is said he was not in the least discouraged but rather stimulated to greater effort. The successful operation of the principle involved in the Hammond was very difficult to attain. The type-wheel, or shuttle, which carried a full font of type and special characters, required greater mechanical accuracy than did the typebar principle as employed at that time. On this feature alone, which is the basic principle of the Hammond, the inventor spent many years of patient toil, before it was brought to a state of successful operation.

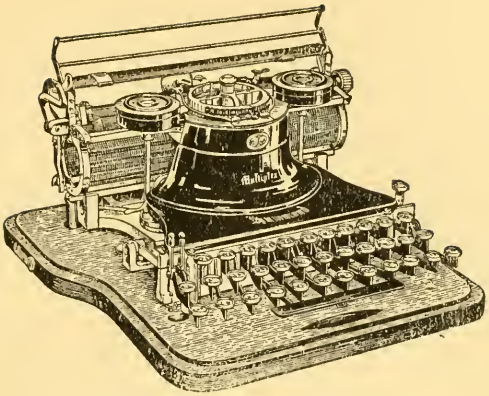
The Remington Company, having seen a model of the Hammond machine during this period, invited the inventor to visit Ilion with his machine for their inspection, with the result that they tried for more than a year, without success, to overcome the difficulties with which the inventor was contending.

Mr. Hammond, possessing a spirit of perseverance, was not discouraged by the failure of the Remington, and set to work with renewed determination, which resulted, after eight years of work, in accomplishing his aim. He produced a machine which embodied his ideas, and placed it on the market about the year 1884.

Each type-wheel of the Hammond, as has been explained, carried a full font of type, which were instantly interchangeable. That is, one type-wheel, or shuttle, might be taken out and another inserted without affecting any of the working parts of the machine. This was the principle for which Mr. Hammond had been striving, and it is on account of this feature that the machine has been able to hold a position in the business world, although its outlet is special and limited. A Hammond type-wheel is made for practically every known language, which accounts for its sales being confined largely to foreign countries.

The Hammond, however, lacks many necessary features for practical commercial service. It is not a good manifolder, nor has it the speed of a typebar machine, two essential qualities highly necessary in the business world today. The first Hammond typewriter had a circular keyboard with keys fashioned after the pianoforte. This was not popular. The "ideal keyboard" was then tried for the reason that its arrangement was more suitable to the operation of the shuttle feature of the machine. It was not a success. At present a keyboard is used with three shift keys; two for capitals and some special characters, one located on each side of the keyboard; the other is for figures and other special characters. None of these keyboards has been satisfactory to the touch typist of the present day.

The touch of the Hammond typewriter is uniform, so also is the typewritten impression, owing to the fact that a depression of the key simultaneously turns the shuttle to the proper character and releases a hammer which strikes the paper from the back, each time with equal force. The alignment is good, from the fact that the type do not strike the paper direct; but the impression often has a blurred appearance. The commercial world today, at least the United States, requires speed; it requires a large number of copies and the best possible results in every respect; hence the fact



HAMMOND
FIRST SUCCESSFUL TYPE-WHEEL MACHINE.

that the Hammond is little used for commercial purposes in the United States. It occupies a special field.

BAR-LOCK

The Bar-Lock is the invention of Charles Spiro, of New York. Mr. Spiro is also the inventor of the Columbia, but it cannot be said that the Bar-Lock is the outgrowth of the Columbia from the fact that these two machines have no similarity whatsoever. The Columbia was a disc or wheel machine and was little more than a toy, while the Bar-Lock is a typebar machine, possessing sufficient merit to justify its continued manufacture.

The Bar-Lock is the first "duplicate" keyboard machine. That is, it is the first machine with a key for each character, having the capitals arranged above the small letters in the same general order. It is also the first machine to be built with the typebars standing in an upright position when not in use. The typebars are so arranged that they form an arc between the platen and the keyboard. The depression of the keys forces the typebars *down* to the printing point, and a spring returns and holds them in position. As a result of this style of construction there is constant stress or

tension on the springs controlling the typebars, which must be overcome when the keys are depressed. Thus gravitation plays no part in the return of the typebars. The typebars are of two lengths, made necessary to accommodate them to the space in the arc.

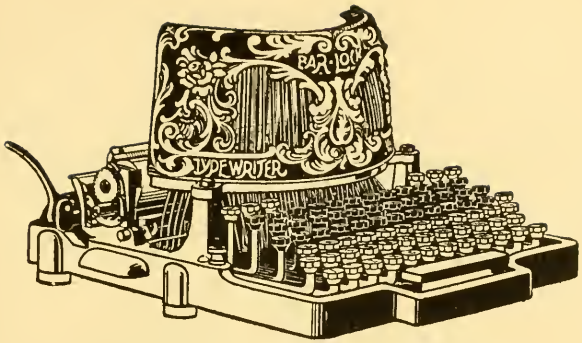
The Bar-Lock derives its name from a series of pins, extending up from a steel plate just in front of the printing point, between which the typebars strike. These pins are supposed to lock the bars and preserve the alignment. There are fourteen pins with thirteen spaces, therefore they cannot be termed guides as the type-guide is understood today. There is no arrangement by which these pins can be adjusted, nor would it be possible, because six typebars are supposed to be "locked" by each of these thirteen spaces. This makes it necessary to bend the bars, without order or system, to fit the spaces between the pins.

The manufacturers of the Bar-Lock claim for it visible writing, w*hich it does not have,* for the reason that the typebars extend up between the vision of the typist and the printing point. In order to see the writing line it is necessary for the typist to lean forward from the regular position of the typist while writing, which is little, if any, improvement over lifting a carriage.

The claims of the manufacturers for visible writing served the purpose at least of suggesting the advantages that might accrue from a machine actually possessing visibility.

The insertion of the paper is not convenient, as it is necessary to reach around back of the perpendicular row of keys. This also makes corrections difficult, especially where erasures are necessary.

The manufacturers also built the Bar-Lock with the universal standard keyboard, employing the shift key. Although this machine was invented and manufactured in the United States, it did not meet the requirements of the ex-



BAR-LOCK
FIRST "DUPLICATE" KEYBOARD, DOWN-STROKE MACHINE.

acting American business man, and as a result is no longer offered for sale in the country in which it originated.

DENSMORE

James Densmore, whose connection with the Sholes, Glidden and Soulé experiments has already been mentioned, later invented a machine to which he gave his name—Densmore. This machine embodied some new features. It had the first line-lock. The purpose of this was to prevent the piling of characters at the end of the line. It was the first to employ ball-bearings in the typebar, and it also introduced the back-spacer in a practical manner.

The Densmore had a keyboard similar to the Remington with a shift key on each side. In an effort to make it more convenient to "get at the work," the inventor devised a plan by which the platen might be tilted forward in addition to raising the carriage.

The original Densmore did not have ball-bearing typebars. These were introduced in the later model. The inventors appreciated the fact that the shock in starting the balls, which necessarily followed a stroke of the finger keys, would cause unusual wear not only on the balls but on the retaining cup. Hence, an accelerating arm or sleeve was

provided to start the typebars, thus relieving the balls of the shock by first receiving the blow and lifting the typebars on the ball-bearings to the printing point. This was not a success, as the friction on the accelerating arm offset any possible advantage that might have been gained by the ball-bearings, although it did relieve the strain or shock on the balls, resulting from the quick, sharp stroke of the keys.

DENSMORE

The machine at one time was used quite extensively in the United States. It embodied the same general principles as the Remington, which may have accounted for its popularity in the typewriter world. Its manufacture, however, was discontinued, the cause for which will be commented upon later.

YOST

G. W. N. Yost, who figured in the production of the first practical typewriter and also produced the Caligraph, later brought out a machine to which he gave his name—

Yost. This was the first machine of any importance to use an inking pad instead of a ribbon. It was also the first practical machine to use a type-guide at the printing point. (This principle was first employed by Dr. Francis.) The guide consisted of a solid block of metal with a square hole in which the type block fitted securely. The work of the Yost was always considered neat and attractive, largely the result of the guide, but the guide was not adjustable. The typebars were made in several sections, and had the machine not been provided with a guide it is doubtful whether the work would have been presentable.

Although the Yost was invented by an American and built at Bridgeport, Conn., it could not hold its position against the more active and effective competition in its own country and was forced, like the Bar-Lock, to find a foreign market.

This machine will be referred to again in the course of the evolution of the typewriter, for the reason that later inventions compelled its manufacturers to change its principles of construction almost enirely. (See page 104)

SPEED CONTESTS

Just preceding the year 1888 the typewriter had grown in popularity to such an extent that competition arose among the users as well as the manufacturers concerning the speed qualities of their respective machines. This competition was stimulated by the demand of the buyer and user who recognized the value of speed, accuracy, and legibility. Accordingly, a contest was arranged to ascertain the respective speed merits of the various makes of typewriters. This contest was held at Toronto, Canada, in August, 1888. Only the Remington and the Caligraph participated. One of the features of this series of contests was writing for five minutes from the memorized sentence "This is a song to fill thee

with delight." This contest was won by Mr. F. W. Osborne, using the Caligraph.

In reporting this series of contests, the *Phonographic World,* the policy of which was controlled by the Remington Typewriter Company, made no reference to the contest won by the Caligraph operator. In the November issue, however, of 1888, in response to numerous inquiries, the *World* produced an extensive article of which the following are extracts:

"By those who have kept informed concerning the results of the recent 'Speed Contests' between the 'Remington' and 'Caligraph' writing machines (the only two machines which have dared to enter for a public contest in the world), it will be remembered that at the International Contest at Toronto, August 13 (1888) last, three leading medals were awarded by the Committee in charge, the first two being given to the 'Remington,' and the third to the 'Caligraph.' The first, a Gold Medal, representing the championship of the world for the greatest speed in writing unfamiliar testimony and business correspondence, was won by Miss M. E. Orr, of New York, a Remington operator; the second, a Silver Medal, in the same class, was won by Mr. F. E. McGurrin, of Salt Lake City, Utah, also a Remington operator; and the third, a Special Medal, being awarded to Mr. F. W. Osborne, of Rochester, N. Y., for writing the memorized sentence, "This is a song to fill thee with delight," the greatest number of times, the operator using the Caligraph." . . .

"We show exact fac-similes of the work of both machines. These pages have been photographed directly from the original copy and are signed by the operators of each instrument. Both pages show excellent work, considering the rapidity with which the keys were struck, and although the Caligraph operator is credited with writing sixty-seven more words than the Remington operator,

. . . the sentence was written correctly by the Caligraph operator only twice, while the Remington operator, in less times, wrote it correctly forty-nine times." . . .

"To have given in the *World's* report a full statement of the writing of the memorized sentence would have been to more widely advertise the Remington machine than was called for at the time in a news article, or than we cared to do. . . . But, as before stated, we have received numerous inquiries as to why the *World* had not reported this matter, and we here present it, in absolute fac-simile, and with straightforward facts, leaving the intelligent reader to be judge of the respective merits of the two performances."

There is much truth worthy of consideration contained in these extracts taken from the *Phonographic World,* which applies with equal force to the contests of today, especially with relation to the quality of the work. The *World* leaves "the intelligent reader to be judge of the respective merits of the two performances," and for that reason a part of the fac-simile copies are submitted on the following two pages.

Typewriting contests were revived many years later, after the typewriter had been greatly refined and improved. On page 42 is a fac-simile, photographic reproduction of a part of the work of Miss Rose L. Fritz, writing in open contest at the rate of 118 words a minute for fifteen minutes without error of any kind. "The intelligent reader" or buyer will "judge of the respective merits of the two performances."

In some of the recent contests writers using other machines than the Underwood have made excellent records, and the work was considered technically correct, according to the rules, but the "intelligent reader" would not accept the work as practical; at least, he would not attach his signature to it; nor will those in control permit copies to be reproduced in this book.

4D

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AWARDED FIRST PRIZE, TORONTO, 1888.
(CALIGRAPH)

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Mae E. Orr

AWARDED SECOND PRIZE, TORONTO, 1888.
(REMINGTON)

If you will take a walk in the woods you will run across a good many kinds of trees. You will see the oak and the pine and the spruce and the maple, each of which serves a purpose of its own, and each of which has been the theme of poets and painters ever since those long-haired individuals began to be looked upon as being part of the human race. But you will also find trees that do not enter into the list of good things and which serve no good purpose, those which bear thorns for example, and others which are poisonous, the dogwood and the like. It is just the same with pulls and if you will but think it over you will find that there was never yet any good thing which did not have spots upon it which if cut out would make it better. The very fact that some part is evil only tends to bring out more strongly the good which is to be found in the rest.

PARAGRAPH, PERFECT WORK OF MISS FRITZ, 1916.
(UNDERWOOD)

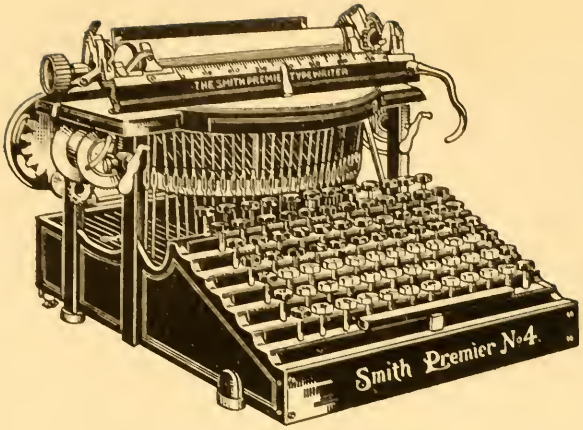
SMITH PREMIER

The Smith Premier typewriter is the invention of Alexander T. Brown, of Syracuse, N. Y., and it got its name from L. C. Smith, famous as a manufacturer of guns. This machine appeared on the market in about the year 1890. It has a duplicate keyboard, or, as its manufacturers term it, a "complete" keyboard, having a key for each character. The Smith Premier embodied many features that were superior to either the Caligraph or Bar-Lock, the two machines preceding it having a character for each key.

The rocker shaft principle employed in this machine was new in typewriter construction. Each finger key stem was attached to a spur on the shaft, and another spur on the shaft was attached to the connecting link, which operated the typebar. The typebars were suspended in a circle, and the impression or line of writing was beneath the cylinder out of sight, as was the custom of that day. The bearings of the typebar of the Smith Premier were very long, which gave better control of the alignment than on any of the previous machines.

The Smith Premier had but one scale and it was not necessary to lift the entire carriage to see the work. The platen was tilted forward by a lever in a convenient manner, and the writing line appeared just above the scale. Erasures and corrections were quickly and accurately made. The machine also employed the first practical means of reversing the ribbon automatically.

Another feature of this machine was the easy means by which the type were cleaned. A circular brush which rested just below the typebars was built in the machine. When it was desired to clean the type the platen was removed, a crank handle inserted and turned until the brush was brought up into contact with the face of the type, when a few additional turns effectually cleaned them. This was



SMITH PREMIER (BLIND)

quite an advantage at that time, because in order to clean the type on the Remington and other machines, it was necessary to raise the carriage, lift each individual typebar, and brush the type one at a time. This always resulted in soiling the hands and for this reason the typist neglected cleaning the type until the untidy appearance of the work made it absolutely necessary. The Smith Premier proved a strong competitor for the Remington, both on account of its merit and the methods of the manufacturer in selling the machine, without regard to uniform price. On account of unusual activity and price cutting the Smith Premier soon secured a large following.

UNION TYPEWRITER COMPANY

The quality of the Smith Premier and other machines, together with the price cutting methods of the manufacturers, resulted in forcing the Remington, out of self-protection, into a combination known as the Union Typewriter Company, composed of the Remington, Caligraph (New Century), Smith Premier, Yost, Densmore, and other companies. This combination was formed in 1893 for the purpose of eliminating competition and maintaining the price.

These companies continued separate organizations but received instructions from, and reported to, the Union Typewriter Company, which controlled the entire situation most effectually, both as to machine competition and employes. In other words, employes could not follow their conviction and go from one company to another without the permission of the company they were leaving, which was difficult to obtain, especially if the quality of their services was such as to justify any one of the companies belonging to the Union Typewriter Company in wanting to retain them. Salesmen and other employes were subject to discharge on account of the slightest error or misdemeanor, and they had no recourse except to quit the business, thereby sacrificing the experience of years. When a salesman was discharged, his name was placed on a black list, and only by special dispensation could he secure employment with any of the aforesaid companies.

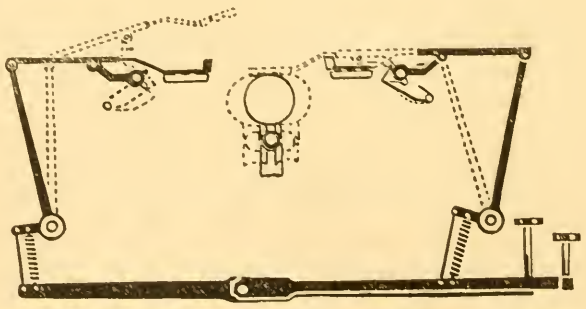
In harmony with a universal law this combination resulted in the "survival of the fittest." The Remington typewriter was a single shift key machine, and the Smith Premier a duplicate keyboard machine. The Caligraph, Densmore and Yost embodied no special features that would justify the expense of maintaining separate organizations to market them. As a result they were placed under one sales department and finally withdrawn from the American market. The manufacture of the Caligraph and Densmore was discontinued entirely, but the Yost embodied certain characteristic features which appealed to the foreign trade, where it now finds its only market.

This combination exists today, but the evolution of the typewriter and the Federal laws have compelled them to change their policy, and the Remington Typewriter Company has now assumed direct and complete control. They now make the Remington, Remington Smith Premier and the Remington Monarch, a later product, information concerning which will be presented under the title "Monarch."

WILLIAMS

The construction of the Williams typewriter is peculiar. The platen and the paper carrier traveled through the center of the machine, between two sections of typebars. It was necessary, therefore, for one section of the type to strike forward and the other backward, which made a difference in the leverage and key tension. The Williams employed two pads for inking purposes, one for each section of typebars. The type lay on the pads face downward when at rest, and as a result it was very difficult to clean them. The pads were quite moist and always exposed to dust.

When a finger key in the front section of typebars was struck, the typebar was lifted *up*, moved *backward* and *down*,—three distinct directions. The type in the back section were, of course, operated in a similar manner, *up*, *forward* and *down*. The Williams was a double shift key machine; that is, it employed one shift key for the capitals and the other for the figures and special characters. The typebar construction was very complicated.



WILLIAMS TYPEBAR
CONSTRUCTION AND ACTION.

The manufacturers of the Williams claimed for it visible writing, and the machine did actually enable the typist to see one complete line of writing, but this immediately passed out of view under a scale into a receptacle for the paper between the typebar sections. The manufacturers

brought out several models of the Williams, but the greatest success of the machine consisted in stimulating the desire on the part of the typist for an actual visible typewriter.

The Williams was not fast; it was not a good manifolder; it was not convenient to insert paper; the type were not easily cleaned; and its only redeeming feature was the one line of visible writing.

NEW CENTURY

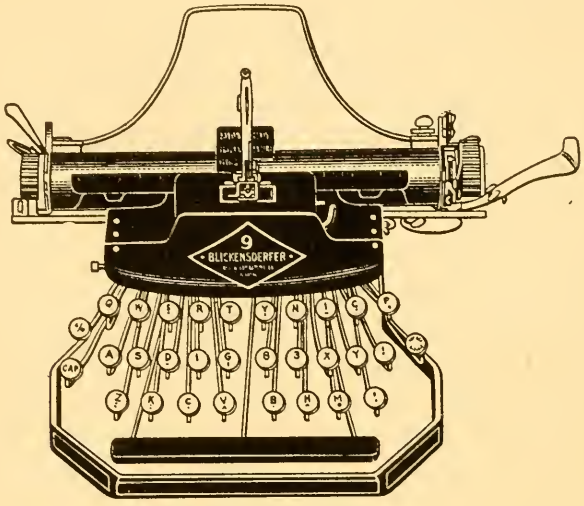
The New Century appeared on the market in 1898. It was generally considered an improved Caligraph, and for this reason it received some considerable attention. It had a number of improvements over the Caligraph, but retained the double keyboard principle. It came at a time, however, when the public were clamoring for visible writing, and because of this fact, together with the fact that it was a double keyboard machine, it was unable to make any headway, and its manufacture was soon discontinued.

BLICKENSDERFER

The Blickensderfer typewriter made its appearance in the early nineties, and is still on the market, therefore it is entitled to consideration in these steps. This machine, commonly known as the "Blick," is a type-wheel machine; that is, the type are all arranged on a wheel, and every type moves when each key is struck. The type do not act independently as on most machines, hence it became necessary to arrange a special keyboard in order to produce the best results from this style of construction, and because of this special keyboard the machine did not meet with favor among touch typists. The supply of ink is obtained from a roller pad.

The "Blick" is small, hence easily portable; it is also a cheap machine, and the style of type may be changed by

changing the wheel. Because of its portability, its simplicity, the ease of changing type, and its price, it has won a place, or at least a niche, in the commercial world. However, it is not found in the large and more important offices where quantity and quality of work are the prime considerations, but among those who have little work, do it themselves, and want it done on a typewriter.



BLICKENSDERFER
(LATE MODEL)

Mr. Blickensderfer died August, 1917, since the foregoing was written.

BLICK ELECTRIC

The maufacturers of the "Blick" produced an electric machine, which promised to revolutionize the typewriter business, but the promise was not fulfilled. It had its advantages, but the disadvantages evidently were greater, because of the complications of the electric motor requirements. The carriage reverse and all other active parts of the machine were controlled by electricity, but the best evidence of its imperfection is that its manufacture was soon

discontinued. The electric typewriter would eliminate to a great extent the human element, and for that reason it is not likely to become popular.

MANHATTAN

The Manhattan typewriter was composed of features that were formerly embodied in the No. 2 Remington. It had no original principles and there was no excuse for its having been constructed. It resembled very much in form and feature the No. 2 model Remington, which the Remington Company had already discarded, and as a result of going backward instead of forward, it had a very short, unprofitable experience in the business world.

FRANKLIN

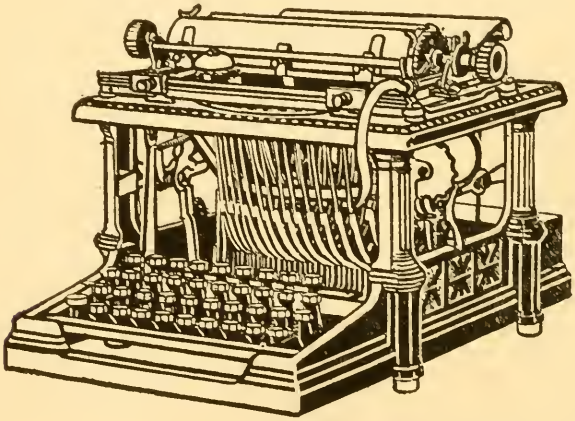
The Franklin typewriter is not entitled to space in considering the evolution of the typewriter, because it advanced no new ideas, it possessed no new features, and as a result it was short-lived. The typebars stood up in front, between the keyboard and the platen, and struck down after the fashion of the Bar-Lock. The keyboard was circular and non-standard. The only reason it is given space here is that it did receive some consideration from the business world which contributed somewhat to the education of the public to the appreciation of the commercial value of the typewriter.

The public having begun to recognize the value of the typewriter, and the sales system of the manufacturers of the better writing machines not having been thoroughly organized, a number of cheaper, inefficient typewriters found a market. This will account for the mention of a number of typewriters that really possessed no features that contributed to the evolution of the typewriter. However,

the business man soon began to appreciate the fact that the best was really the cheapest.

REMINGTON-SHOLES

This machine got its name from a Mr. Remington and a Mr. Sholes, who were the patentees. These gentlemen were direct descendants of the Remington and Sholes families of typewriter fame. They advanced the foolish argument that "if horses and dogs are bought by pedigree the same plan might well be adopted in selecting a typewriter." The name Remington-Sholes attracted more attention than any other feature of the machine, but it was finally changed to Rem-Sho, for legal reasons.



REM–SHO
FIRST BASKET-SHIFT MACHINE.

The Remington Typewriter Company sought and secured an injunction restraining the use of the name "Rem" as an abbreviation of Remington, hence the name was changed to Fay-Sho. The case was appealed, and the court's decision which gave the injunction was reversed. In the meantime, however, the machine had lost favor, if it ever possessed any, with the public, and it was compelled to seek a foreign market, as did several other machines that

were unable to make good in the United States. Later, this machine was reconstructed almost entirely and given the name Japy, as the "pedigree" proposition had failed to contribute to its success as had been anticipated.

The "Rem-Sho,-Fay-Sho,-Japy" had a keyboard similar to the Remington, but instead of shifting the platen the whole type basket was shifted. This machine, of numerous aliases, therefore, is entitled to the distinction of being the first to shift the type basket for capitals. Another feature that met with some favor was the interchangeable carriage. It was possible to use carriages of different lengths on this machine. It was also the first blind machine to have the marginal stops in front.

YETMAN

The Yetman typewriter was invented by Charles E. Yetman, who labored for many years trying to bring it to a degree of perfection that would justify its being placed upon the market. This he succeeded in doing about the year 1903.

This machine was intended to serve a double purpose. That is, it might be used as a regular commercial machine, but its principal purpose was for the transmission of telegraphic messages. By pressing a lever on the left of this machine it would open a telegraphic circuit and connect the keys in such a way that telegraphic messages could be sent. A corresponding lever on the right side connected the keyboard with the typebars and a message could be sent and a copy made in type at the same time. It was also possible, by releasing the lever on the left, to convert it into a typewriter for ordinary commercial use, without any connection with the telegraphic circuit. It will be seen, therefore, that the machine could be used for either or both purposes.

The work of this machine was effectual, and it seems strange that the principle has not survived and developed; but it was evidently impractical from the fact that it has not been revived since the company, organized to promote it, met with reverses which caused its failure. The career of this machine was short, but it promoted the idea of visible typewriting among telegraph operators, for whom it was primarily intended. Although few machines were made and used, the telegraph operators learned through the *Telegraphic Age* to appreciate the value of visible writing for receiving and transmitting messages.

FOX

The Fox typewriter is a machine that possesses no special merit. Its principal asset, in the original blind machine, consisted in the typebar hangers. Its manufacturers claimed that wear and consequent lost motion in the typebar bearings, which would affect the alignment, could be readily adjusted. It was originally built after the style of the Remington, that is, employing the understroke blind writing principle.

All manufacturers up to this time found difficulty in building their regular machine in such a manner that it would respond to the speed of the typist, and most of them provided special escapements, or reverse-action dogs, which an ordinary operator could not use. The Fox typewriter made an escapement which could be adjusted to meet the requirements of the typist more nearly than any of the preceding machines. It was possible to cause the escapement to be made either on the upward or downward movement of the typebar.

The Fox contained no other improvements that might be considered in the evolution of the typewriter over the machines that had preceded it and did not possess sufficient merit in its blind style of construction, or in any other

style for that matter, to encourage a very extensive trade, as compared with some other machines.

PEERLESS

The Peerless typewriter is perhaps entitled to mention, not because of the value of the machine, but because the Smith Brothers, who became famous through the manufacture of the Smith Premier typewriter and later the machine to which they gave their name, were interested in the machine. The Peerless typewriter was a double keyboard machine. It contained no advantages over previous machines and is given space here only for the reason as stated above.

DUPLEX

The Duplex typewriter was an invention that did not serve the purpose for which it was intended, that is, to increase the speed of the typist. It was a double keyboard machine divided into four sections. The capitals were on the upper left side. There were two sets of small letters occupying the lower half of the keyboard, while the upper right half of the keyboard was taken up with numerals and punctuation marks. It provided a means by which two keys might be struck at the same time, thereby making two impressions at once. That is, the typebars on the left struck one space ahead of those on the right, and by striking any two keys on opposite sides at the same time, it would give two impressions in the proper space, the left coming first.

This method of operating was found to retard, rather than advance, the speed of the typist, and as a result the purpose of the machine was not realized and its manufacture was discontinued.

ELLIOTT-FISHER

The original idea of the early inventors of typewriters,

it seems, was to write in bound books, but no practical results in this direction had been attained until the Elliott Book Typewriter was placed upon the market. This machine was later supplemented by improvements brought out by a Mr. Hatch and the machine became known as the Elliott and Hatch typewriter. This machine reversed the general style of typewriter construction by having a stationary, flat writing plate and a movable head and keyboard. It would indeed write on books quite successfully, but it required a great deal of shifting and adjusting to hold the bound page securely in position in order to produce satisfactory results. The machine traveled from left to right across and down the page. The entire machine swung on a back way-rod, and was supported in front by two wheels running on a flat steel track. This way-rod and front track or frame were parallel, and supported the machine in its movement from left to right. The side frame or plates, which supported the machine in its course down the page, were cogged to correspond with two cog-wheels which measured the line spacing.

This machine was not fast, because of the fact that the entire machine traveled over the printed page, instead of carrying the page as did all other machines preceding it. This changed the position of the keyboard from the left to right every time a key was struck. It also necessitated a change of the entire machine downward every time a line was written. In other words, the entire machine traveled on a frame over the writing plate from the upper left hand corner of a book or printed page, down to the lower right hand corner. If the book was large the arms had to be extended to write the first line, while on the lower line it was necessary to draw the arms down following the movement of the machine. In fact, *the finger keys never occupied the same position twice in writing a page.* It will be seen from this that speed, together with accuracy, was impossible.

The work was beneath the machine and the whole typebar and finger key lever system, ribbon, and all working parts of the machine had to be moved in order to see the work.

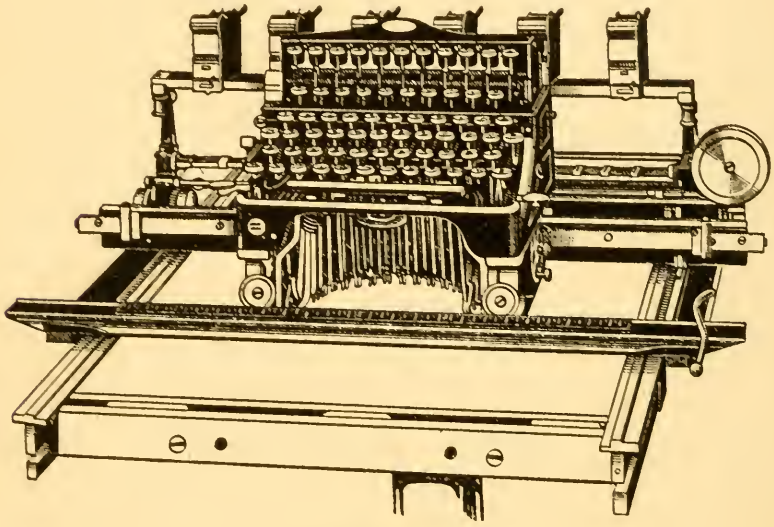
During its introductory period a machine was invented by Robert J. Fisher, embodying the same general principles so far as the operation of the machine laterally and up and down was concerned. Two draw bands, or mainsprings, were necessary to pull the machine. The typebars stood above the printing point and struck downward, something after the fashion of the Bar-Lock. The keyboard was on top of the machine above the typebars, which made type-cleaning extremely difficult. This machine required three universal bars for the keys; one for the lower bank, another for the second and third banks, and a third for the upper bank.

By pressing a lever which threw the ribbon back, it was possible for the operator to look down through the machine and see the work to ascertain whether or not a mistake had been made. If it was found that a correction was necessary, the whole working parts of the machine had to be moved. On the Elliott and Hatch machine, if the operator was in doubt, it was necessary to move the entire machine to remove the doubt.

A combination was formed between Fisher and the Elliott & Hatch Company, which became known as the Elliot-Fisher Company. This was due principally to the fact that the Fisher machine made it more convenient to see the writing. In other words, the necessity for visible writing was recognized in order to satisfy a desire with which the minds of the typist and the business public had become imbued.

The Elliott-Fisher writes on a flat surface and there are many claims made for the machine on account of this fact, but the loose-leaf system of binding books soon mini-

mized the advantage of the Elliott-Fisher machine for writing in books and as a result the company has turned its attention almost entirely to billing and form work. For some time their business was quite extensive in this line, and it is still their principal asset, but progress means development, and the typewriter industry provides no exception. The Elliott-Fisher is still active, but not to any great extent as a correspondence or book typewriter, the purpose for which it was originally designed. The following is a cut of the latest model Elliott-Fisher.



ELLIOTT-FISHER

The machine of today embodies the same general principle. The improvement consists principally in making the work more visible.

OLIVER

The Oliver typewriter is indeed an ingenious machine. It is the product of the mind of Thomas Oliver, a minister. It is said that Mr. Oliver, at a conference of ministers,

learned of the value of the typewriter for preparing and preserving records of semons, and although he had never seen a typewriter, he determined to construct one. The truth of this statement is confirmed by the general appearance of the machine, as there has never been a typewriter of similar construction either before or since.

The typebars stand erect in two banks, one on each side of the printing point. There are fourteen typebars in each bank which stand a little back of perpendicular when in a position of rest. These typebars vary in length; that is, beginning with the inside bar, each succeeding bar in the bank is just a little longer, stands a little higher, and sets a little farther back than the one preceding it. Both banks are alike, that is, the typebars in each bank are of corresponding length. The outside bars, or those at the extreme right and left, are about three times as long as the inside bars.

To make these bars strike a common center with the same degree of speed and force was indeed a difficult mechanical problem. The typeblocks on the inside bars are just a little heavier than on each succeeding bar, to make up the necessary force that a body having a greater drop acquires from gravitation. It was also necessary to change the leverage of each succeeding bar, in order that the speed might be increased accordingly. As these typebars stand in an upright position when not in operation, they require tension springs to return them to this position. Although the forward movement of the typebar can be regulated by leverage to equalize the speed of the typebars, and the weight of the typeblock regulated to equalize the impression, this leverage and weight must be overcome in the return of the typebars. The connecting links that control the typebars are attached to "shock absorbers" on the finger key lever. This is necessary to prevent a disagreeable touch in starting the typebars, which incline a little back of perpendicular when in a position of rest.

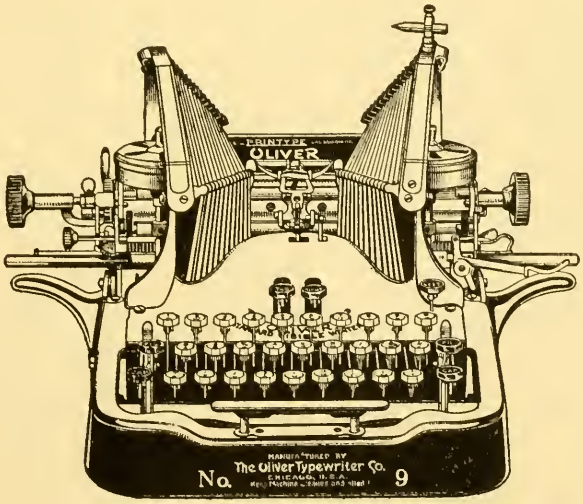
Each typebar carries three characters. This makes a double shift necessary. When the carriage is in its normal or central position, the machine writes small characters without shifting. To write capitals the carriage must be shifted backward, while the figures and punctuation marks require a forward shift. It is absolutely necessary that the desk on which this machine sets be level, otherwise the shifts work very irregularly. In fact, if the desk be sloped equal to that of a cashier's desk, the backward shift will not work at all. The shift keys at best are very heavy because they are not aided by gravitation.

Visible writing is claimed by the Oliver, but the claim is without the foundation of fact, at least in the sense of complete visibility. Only the last ten characters of the line of writing can be seen, and if it is necessary to read the complete line or several lines to get the context, the carriage must be released and moved back and forth in order that the writing line may appear in the reading space between the two banks of typebars. Therefore, to read several lines on the Oliver might be aptly compared with reading a newspaper through a knot-hole.

The Oliver is considered a good manifolder; it does good stencil work; it maintains its alignment fairly well; and is considered quite durable, but it lacks speed; it does not have a standard keyboard; it is extremely noisy, and when it is necessary to make erasures they have to be made between the two banks of type. This necessitates great care, lest the hand become soiled by contact with the face of the type, which are the most exposed part of the machine. The adjustments, levers, and releases used in the operation of the Oliver are back and below the typebars. There is no carriage reverse lever. The carriage is reversed by the left hand pushing in on the cylinder knob, and as a result the line spacing does not take place until the carriage approaches the end of the line. In fact, the

Oliver lacks many refinements and conveniences that other typewriters have.

The machine, however, is better than the policy of the company, which has always been uncertain and vacillating. There has never been any fixed price on the machine, although catalogued at one hundred dollars. Within the last few months the price has been advertised openly at forty-nine dollars, which would be about the average price received for the machine since its introduction. This price, however, demonstrates that the manufacturers recognize that it is not worth what other machines bring, and this change has placed it in its proper position—about half the standard value.



OLIVER

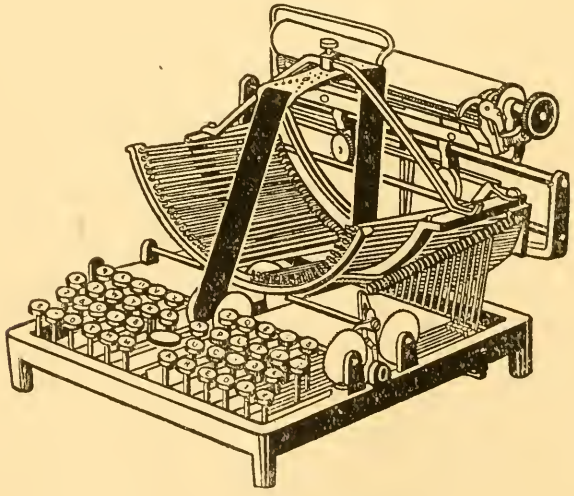
When the Oliver was first placed on the market its manufacturers and salesmen everywhere claimed for it visible writing, all of which served to stimulate the increasing desire for a typewriter that would actually produce visible writing.

VISIBLE WRITERS

The development of manufacturing facilities, the requirements of the business man and the demands of the typist, resulted in directing the efforts of inventors toward producing a strictly visible writing machine, as has been shown. Many unsuccessful efforts had been made, and some manufacturers actually claimed visible writing, but their claims were not sustained by practical results, as some machines only showed one line, others a short space between the bars, while on others it was necessary for the operator to lean forward in order to see the work.

PROUTY

In response to the requirements of a universal demand many efforts were made to invent a machine that would produce and continue visible writing from the first to the last word. In 1888, E. Prouty, of Chicago, Illinois, invented a front stroke machine to which he gave his name. Mr. Prouty more nearly accomplished the desired result



PROUTY
FIRST FRONT STROKE MACHINE.

than any former inventor, but he failed in that the writing was hidden to the extent of the width of the ribbon. This machine, therefore, contained nothing more than an idea, which, having been sown in the fertile mind of genius, took root and produced an abundantly satisfactory harvest, as future developments show. The machine embodied the first front stroke principle, and the writing was visible except at the immediate writing point, this being covered by the ribbon which ran from the front to the back of the machine instead of horizontally, as on all typewriters of today.

GRUNDY

On June 11, 1889, Mr. Arthur Grundy, of Whitestone, New York, secured a patent for a front stroke machine on which the ribbon ran horizontally, falling back out of the vision of the writer after the impression had been made. In his patent claim Mr. Grundy says: "The exposing of the line of printing is brought about primarily by mounting the inking ribbon upon a tilting frame, which is raised to position at every stroke of the type arms."

This machine was never placed upon the market and is only given space here because it advanced an idea in the evolution of the typewriter from which the business world has received great benefit.

DAUGHERTY

The next machine and a more highly developed product was the Daugherty. This machine also embodied the front stroke principle and the writing was entirely visible all the time, but it was only a step in advance of previous efforts of manufacturers to produce a strictly visible writing machine without impairing in any way, but rather

improving, the efficiency of blind machines. This machine was simple and contained very few parts—in fact so few that the requirements and refinements necessary for all kinds and classes of business were lacking, but its advantages as well as its disadvantages served to suggest improvement over the Prouty, and it is entitled to consideration and great credit in the evolution of the typewriter.

An effort was made to improve the machine and make it fit the requirements of the business world, but it had gotten a wrong start, and although its name was changed to the Pittsburg Visible, it could not overcome the handicap of a "wrong start," and as a result the machine was not a success. However, it embodied ideas that served to assist in the perfection of its immediate successor.

UNDERWOOD

The Underwood is the first *practical* front stroke, completely visible writing machine, and, as will be shown, *the pivotal machine which revolutionized the typewriter industry* by forcing other manufacturers to turn round to a common-sense basis. Hence, the Underwood is the last step in the evolution of the typewriter today. The machines mentioned hereafter, that have been compelled to imitate the Underwood, only serve to emphasize this fact, and for this purpose and for historical information are considered.

Mr. Franz X. Wagner, of New York (recently deceased), had been associated with the development of the earliest models of the Remington, Caligraph, and other writing machines since their inception. This gave him an extensive experience in typewriter construction, as well as a thorough knowledge of public requirements, and the desires of the typist for visible writing. He was also familiar with the efforts and failures of manufacturers to produce a satisfactory visible writing machine.

Profiting by the mistakes of others, but more especially by personal experience, Mr. Wagner invented a typebar mechanism and incorporated it in a machine, for which he filed application for patent, April 27, 1893, the same being granted July 31, 1894 (No. 523698). This machine later became known as the Underwood.

The result of Mr. Wagner's invention not only solved the problem of visible writing, for which other inventors had been striving for years, but the fundamental principles involved in the Underwood brought about radical changes in future typewriter construction. This machine not only produced actual visible writing, from the first to the last word—for which typists had been asking every time they raised the carriage to inspect the work—but it embodied many other radical, practical improvements.

It is truly said that typewriter inventors first devise the principle and construct the typebar, then build the machine around it. Mr. Wagner's chief object was to invent a strictly visible writing machine without sacrificing any of the advantages employed in former typewriters. This he did, and the style of mechanism necessary to accomplish his object developed so many excellent, superior features that the results even exceeded the anticipations of the most ardent advocates of visible writing. For example: The front stroke principle of the typebar brought the type, face up, in front of the typist, practically inviting the brush, which resulted in clean, clear impressions. The marginal stops are in front; the scale with which the machine is provided for setting marginal stops, tabular stops (corresponding with tabular scale), and the scale locating the exact position of printing, are also in front; and many other conveniences which older machines did not possess.

The Underwood typewriter, which was manufactured

by the Wagner Typewriter Company during its experimental period, was invented and introduced at a most opportune time. The efforts of other inventors and the advertising of other manufacturers, who had attempted to produce visible writing, had thoroughly prepared public opinion for it, and the sterling qualities of the Underwood not only satisfied their desires, but inspired their immediate enthusiasm.

UNDERWOOD

Mr. John T. Underwood, who had been connected for many years with the typewriter supply business, was thoroughly familiar with the requirements of the trade. He recognized fully the value of visible writing, as well as the many other excellent features employed in the machine, and as a result bought Mr. Wagner's inventions and interests. Mr. Underwood associated with him Mr. D. W. Bergen, present treasurer of the Underwood Typewriter Company, and later Mr. S. T. Smith, General Manager of the company, which position he retained until his death in May, 1915.

Inasmuch as the Underwood represents the acme of perfection in present-day, practical typewriter construction, it is not out of place to describe the machine more in detail.

The Underwood typewriter first occupied three rooms in the St. Paul building, 220 Broadway. In 1894-5 a few hand-made models were produced. In 1896, the estimated output was fifty machines; in 1897, two hundred eighty-six; in 1898, two thousand one hundred sixty-seven. From this time the growth of the Underwood has been phenomenal, both on account of the merit of the machine, and the broad policy of the Company.

The Company soon found it necessary to seek larger quarters, which were secured in Bayonne, New Jersey, in 1898, but the demand for the machine became so intensely active that it became necessary to make further provision for better manufacturing facilities in a permanent home. This resulted in the purchase of a site at Hartford, Conn., to which place the factory was moved in 1901. At that time the employes of the factory were only about three hundred—today, under normal conditions, they exceed five thousand.

The Underwood typewriter is most compact and complete. It is the embodiment of strength, symmetry, and simplicity.

There are four fundamental principles in the construction of a typewriter to which all others are supplementary. First, the typebar construction and action, which makes the impression; second, the escapement or movement of the carriage from right to left, which gives new space for each succeeding character; third, the movement of the ribbon which provides coloring matter for the impression; fourth, the return of the carriage from left to right.

The Underwood typebar construction is unique, there

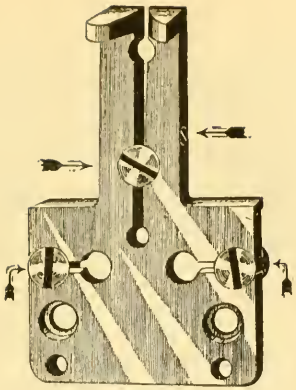
being but three parts—the finger key lever, the connecting link, and the typebar proper—each of which is simpler and stronger than the corresponding part of any other typewriter. In addition to the simplicity of the typebar construction there is but one part to all of the typebar bearings; one part to all of the bearings of the links; and one part to all of the bearings of the finger key levers.

UNDERWOOD TYPEBAR BEARING

The typebar construction of the Underwood is such that the impression and the escapement are both made by the typebar proper at the same time; that is, while the type impression is being made, the heel of the typebar at the bearing comes in direct contact with the universal bar which controls the escapement, thus eliminating all possible lost motion between the stroke of the key and the escapement. This is not common in other machines.

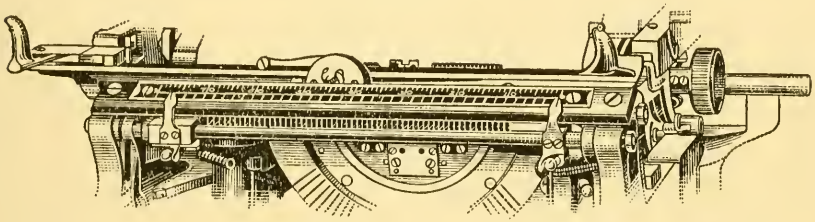
The position of the type, as referred to before, enables the typist to clean the type instantly and as often as needed, without soiling the hands. The Underwood is also provided with an adjustable type-guide, which insures absolute control of the typebar at both ends, at the bearing and the printing points.

The marginal stops are set instantly at any desired point without guess or doubt. It is also possible to get into the margin on the left without moving the stops by simply depressing a lever at the right of the thumb-piece on the right, front corner of the carriage frame, and



UNDERWOOD ADJUSTABLE TYPE-GUIDE

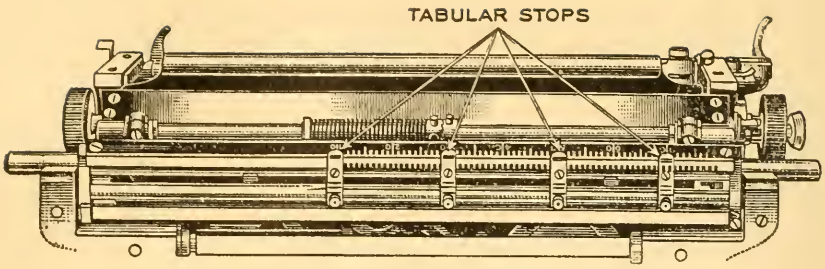
pulling the carriage over. To get additional characters at the end of the line after the keys are locked, touch the button above the back-spacer on the left of the machine.



UNDERWOOD MARGINAL STOPS
(IN FRONT)

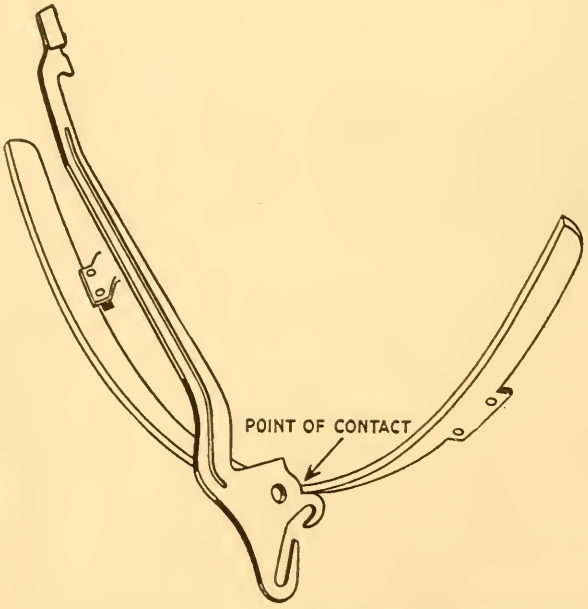
Ball-bearings are employed wherever it is mechanically practical. The carriage rides on ball-bearings, the rotary wheel escapement is on ball-bearings, and the mainspring rotates on ball-bearings, all of which make a complete circle, thus providing for an even wear on the bearings.

The Underwood typewriter embodied the first in-built tabulator and controlled all patents of any kind covering the tabulating idea. The tabulator stops are attached to a rod in the back and may be shifted to any desired position on the tabular rack, the scale of which corresponds with the front scale. Any number of stops may be provided.



UNDERWOOD TABULAR STOPS

The forward movement of the typebar is accelerated by means of a cam in which the actuating lever works, and while this insures a quicker forward movement, the reaction of the universal bar, with which the typebar comes in direct contact, forces the quickest possible return

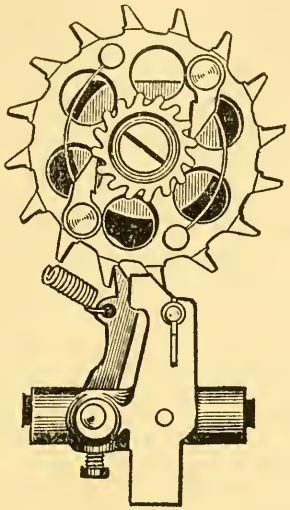


UNDERWOOD TYPEBAR AND UNIVERSAL BAR

of the typebar. This is most important as speed and accuracy in typewriting consists more in the *return* of the bar than in the forward movement. This comes from the fact that the forward movement is governed by the

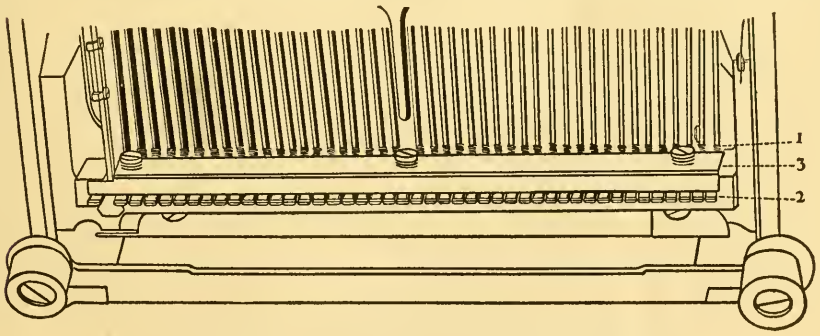
skill of the typist, while the return movement depends entirely upon the mechanism of the machine.

Not the least among the many original features of the Underwood typewriter is the placing of the right hand shift key down in the lower bank on a level with the left



UNDERWOOD ESCAPEMENT

hand shift key. This has made possible a balanced hand action, so necessary in touch typewriting. The accurate, even escapement of the Underwood typewriter is the result



UNDERWOOD INDIVIDUAL KEY TENSION

of the rigid dog being beveled, which permits the carriage

to start forward instantly the typebar leaves the printing point. The individual key tension of the Underwood, another orginal feature, makes it possible to adjust each finger key to the desire and requirements of the touch typist. This feature has not as yet been successfully imitated.

One of the splendid though seemingly minor features of the Underwood is the cushion upon which the type rest. This is patented, and consists of a bag of shot to prevent a rebound when the typebars return to the position of rest. In addition to the cushion preventing reaction of the typebars, the shot, being round, the return of the typebars keeps the shot in their proper position in the bag. This contributes greatly to the speed and accuracy of the machine, by preventing the type from clashing on the rebound.

Much more might be said with reference to the many superior features of the Underwood typewriter, but it could not be expressed more intelligently and impartially than by quoting the certified report of the Franklin Institute accompanying the Elliott Cresson Medal, which it issued to the Underwood Typewriting Company in 1910 for "Ingenuity, Skill, and Perfection of Workmanship."

The Franklin Institute of Pennsylvania was established nearly a hundred years ago. Its object is the promotion of the Mechanic Arts, by educating mechanics and encouraging manufacturers "by offering premiums on all objects deemed worthy of encouragement, and examining all new inventions submitted to them." The membership of this Institution consists of the most expert and influential body of mechanical engineers in the world, and its awards are recognized as the highest and most important that are issued. The Franklin Institute issues a number of medals, of which the Elliott Cresson is the highest. The value of its awards will be appreciated more fully from the fact that its recognition can be gained only through the medium of merit.

The awarding of the Elliott Cresson Medal is safeguarded by the publication of the Committee's report, setting forth the Institute's intentions "in three successive issues of the Journal of the Franklin Institute."

The Underwood Standard Typewriter was before the Institute for investigation for more than a year before the final granting of the award. The report accompanying the medal follows:

"HALL OF THE INSTITUTE

PHILADELPHIA, February 2, 1910.

No. 2473.

The Franklin Institute of the State of Pennsylvania, acting through its Committee on Science and the Arts, investigating the Underwood Typewriter of the Underwood Typewriter Company, reports as follows:

In the thirty-five years that have passed since the Franklin Institute was called upon to pass judgment upon the merits of the first practical typewriting machine that was then being offered for general use, as embodied in the Sholes and Glidden invention, (later the foundation of the well-known Remington Typewriter) the writing machine has become indispensable to our business life. It is but natural that so important and useful a piece of mechanism should have undergone in these years many changes in construction in response to the demand for greater efficiency and wider range of work as its use became more general. To these improvements an army of ingenious mechanicians have given time and talent, out of which efforts the marvelously complete typewriter of today has developed.

During the first fifteen years of writing machine history the understroke machine attained such prominence that few looked for any radical change in the then accepted form, which had reached enormous demand, and was considered to be well-nigh ultimate perfection. There were some minds however that reasoned that the capacity of the typewriter could be greatly increased by some new arrangement of typebar action that would cause the printing to be made in full view of the operator, and thus avoid the necessity of lifting the platen in order to see the writing accomplished.

Evidence of this conviction began to appear in practical form with the invention of the front stroke visible typewriter as shown

in the patented efforts of Messrs. Prouty and Hynes, No. 389854, September 18, 1888. Like many others this first attempt lacked in details and completeness many essentials to qualify it as a rival of the well accepted machines of the older form. Other inventors however soon began to supply the deficiencies, and in a very short time the essentials of a complete and practical visible typewriter had been devised, and the threatened invasion of the field began to look more formidable.

Contributions of value in this new departure developed rapidly in the years following 1890, and it is in part from these inventions that the present Underwood Typewriter obtained its footing, which paved the way to the high state of perfection of that machine as it exists today.

The inventions patented and controlled by the Underwood Typewriter Company now number more than fifty, printed copies of thirteen of the more important ones issued between the years 1890 and 1906 are on file with the papers pertaining to this case, and may be consulted for more detailed description of the devices therein covered. (Patent numbers and dates only omitted.) Among the more prominent features of the Underwood Typewriter which merits special mention we desire to refer to the Gathright Tabulating device, patented in 1890. This is an ingeniously contrived element to equip the machine with facilities for tabular work and bill writing, adding notably to the field of usefulness of the writing machine.

This invention, largely copied, has been held by the United States Circuit Court of Appeals, in an action for infringement, to be a basic patent. The Court in sustaining this patent says: 'In short we are constrained to say that to Gathright belongs the credit of constructing the first commercially successful tabulator, his invention belongs to that large class, which has ever been treated with liberality by the courts when the inventor by an apparently simple change, addition or transposition of parts, has converted imperfection into completeness.'

The tabulator consists of a system of adjustable stops mounted upon a special rack-bar running parallel with, and back of the platen. When these movable stops are set at desired intervals along the rack-bar they act as positive stops to bring the platen into position to print columns of figures. A tabulator key releases the platen from the restraint of the usual escapement rack and allows it to make a quick pass to the tabulator stops, one after the other as desired. Con-

nected with the release key is a friction device that places the speed of travel of the platen over the long interval between the tabulator stops within the control of the operator, by using more or less pressure upon the key as the platen moves; these tabulator stops do not in any way interfere with the regular type-width escapement of the platen when no tabulating is to be done.

The whole tabulating device is an added facility that materially increases the scope of the typewriter for column work and is an important time saver to effect positive wide interval stops of the platen.

A very important device is the escapement, which controls the intermittent lateral movements of the platen, with a degree of speed and precision that is remarkable. Perfection in this part of a typewriter implies a device that will actuate the platen immediately after each type impression is made, without perceptible effort on the part of the operator, and with a rapidity of action far beyond the requirements of the most expert operator, at the same time the wearing quality of the parts that affect the release and catch movements must be such as will withstand the severe shocks given one hundred thousand times daily for several years with undiminishing reliability.

The committee has taken pains to thoroughly test the Underwood Escapement with regard to its ultimate speed, and for wearing qualities as developed in typewriters having had eight years of hard usage.

Expert, prize winning operators have demonstrated their ability to write for an hour at the remarkably high speed of ten strokes per second, and have written for the committee, from one to two minutes, at the enormous rate of fourteen strokes per second, without errors.

An electrically driven automatic typewriting machine which operates in the manner of the familiar mechanical piano player has also demonstrated its ability to produce beautiful work on the Underwood Typewriter at a speed of fourteen strokes, or impressions, per second, continuously. Having thus obtained reliable results of the efficiency of the Underwood escapement up to fourteen strokes per second, your committee felt an interest in an effort to determine the ultimate speed efficiency of the escapement. To reach this result a mechanical writer was made that would enable tests of speed to be made indefinitely, and with the aid of this machine the typewriter was operated at increasing velocities up to twenty strokes per second. The result showed that, up to eighteen strokes per second, the Underwood Typewriter responded perfectly, under normal conditions of spring tension

to platen, which rate is already far beyond the reach of the human hand. As to the durability of the escapement parts we find in typewriters which have had more than five years of average usage no detrimental wear, which means much for the design of the device and for the good workmanship given it.

The combination of key-levers and type-bars with their connecting links, and the mountings for the system, form a very important part of the typewriter details. To secure a light, uniform touch, with ample power for heavy manifolding work, and an absolute alignment of printed matter always, with a controlled evenness of impression can only be reached through superior design and good construction. The extreme simplicity of the Underwood key and type-bar system contributes much to the excellent result obtained. A key-lever, a type-bar, and a connecting link form the complete working combination. Only when this combination is compared with the same parts in a large number of the most prominent typewriters now in use, which employ from eight to sixteen parts for the same service, can we fully realize what 'simplicity' means, and where simplicity of design is backed up by the use of the best materials and by good construction, the effectiveness and wearing qualities are certainly increased. It is in this part of the typewriter that hard usage will soon produce ill effects if either the design or the workmanship is faulty. In the Underwood system the action of the type-bar to move the universal bar, which prepared the releasing dog of the escapement just before the type impression is made, is not only a sure means of releasing the escapement at the proper instant, but it is done without being felt by the operator. A rigid abutment situated a little below the middle of the length of the type-bar, acts as a stop to limit the stroke of the type, so that the impressions are very uniform, not varying perceptibly with the strength of the impact upon the key, and this adds greatly to the neat appearance of the writing. Each key-lever has its individual tension spring located quite near the fulcrum, which once adjusted to overcome simply the weight of the key-lever, is the only adjustment necessary. This tension is so little beyond the balancing of the weight of the lever that it is not felt by the operator, and the lightness of touch is not impaired. No other spring is used in the type-bar action.

The alignment of the Underwood Typewriter is accomplished when the type are placed upon the type-bars, before the latter are put into the machine. When the type-bars are placed in position, they are in alignment and will never change. The permanency of


ELLIOTT CRESSON MEDAL.
FOUNDED 1848.


AWARDED BY THE FRANKLIN INSTITUTE OF THE STATE OF PENNSYLVANIA.
To
The Underwood Typewriter Co.
for
Ingenuity, Skill and Perfection
of Workmanship.
1910.

the alignment is materially assisted by the type-bar guide so located that it does not interfere with the visibility of the writing while affording a perfect locking device for the type when at the printing point, effectually preventing any side motion of the type-bars. The accuracy of alignment is further assisted by hanging the type-bars in a slotted segment, every slot having been cut by a specially constructed machine, so perfectly that they all converge accurately to a common center. Aside from the several prominent features herein referred to at some length, there are still many essential parts that in some modified form are common to most of the high grade typewriters of the time. The Underwood lacks none of the desirable features that practical use has qualified as essential to the typewriter complete. In all these parts we find the same painstaking simplicity and effective form of design.

Abundant opportunity was given the committee to examine minutely every detail of the manufacture of its writing machine at the factory, in Hartford, Conn., where, under the most able management, the best materials obtainable are converted by a very superior equipment and through exacting workmanship into a writing machine of extraordinary perfection in its minutest details.

In recognition of the very meritorious inventions embodied in the Underwood Standard Typewriter, and of its exceedingly simple and efficient details of construction, forming a writing machine of the most advanced type, with unsurpassed capabilities and excellent make-up throughout, the Institute awards the Elliott Cresson Gold Medal to the Underwood Typewriter Company, for the Ingenuity, Skill and Perfection of Workmanship displayed in the Underwood Typewriter.

Adopted at the stated meeting held Wednesday, February 2, 1910.

(Seal)

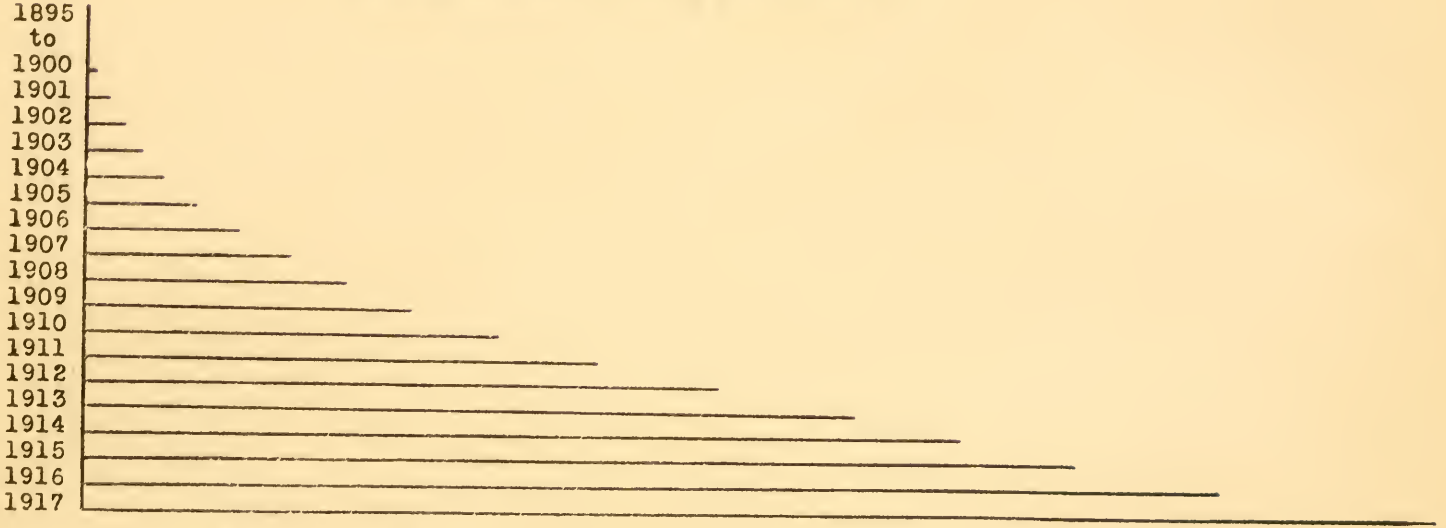
WALTER CLARK,
President,

R. B. OWEN,
Secretary.

Countersigned, THOS. SPENCER, Chairman of the Committee on Science and the Arts."

Diagram

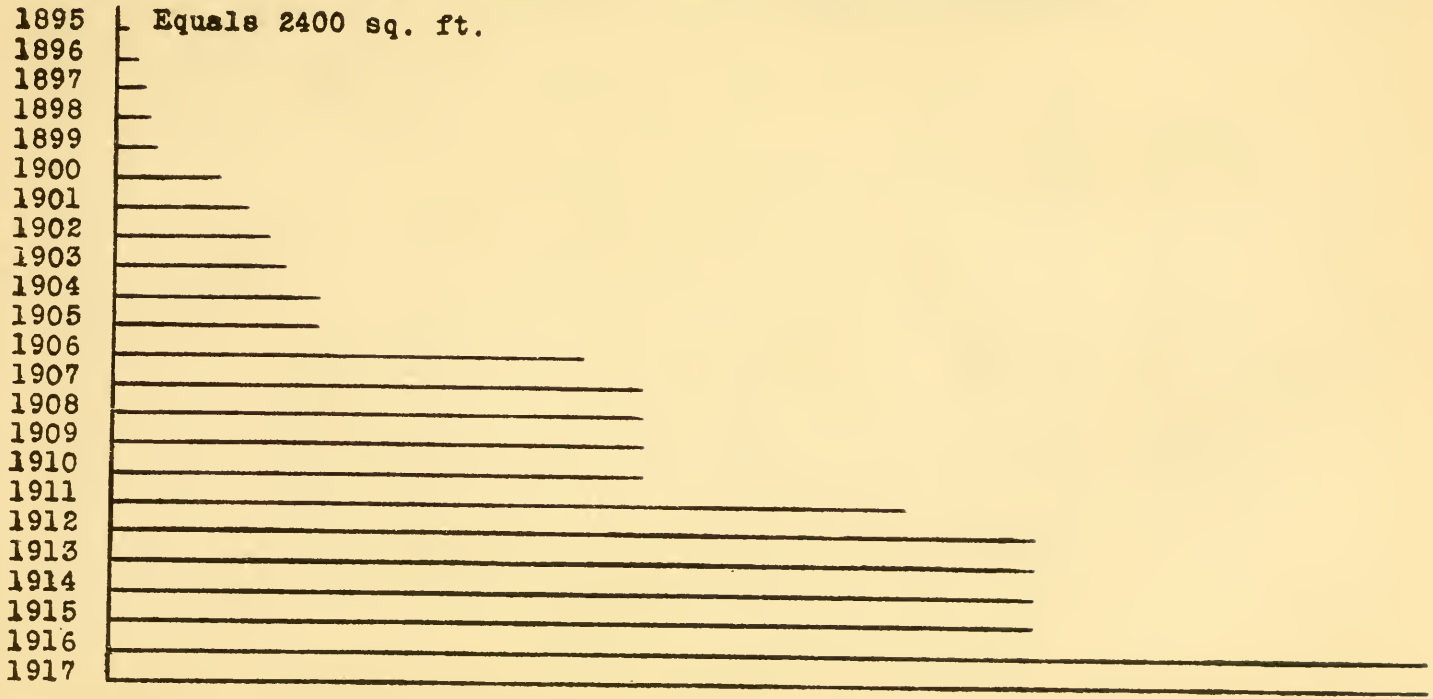
Showing Growth of Underwood Product



— Equals 21,000 machines

Diagram

Showing Growth of Underwood Typewriter Factory



In 1890, four or five years before the first Underwood was built, the Hammond Typewriter Company was awarded the Elliott Cresson Medal for its shuttle feature, which provides for the use of various languages merely by changing the type shuttle. This is the one feature that has kept the Hammond before the business world, thus demonstrating the discernment of the Franklin Institute verdict.

Although seven years have elapsed since the Elliott Cresson Medal was first awarded the Underwood Typewriter, no other typewriter has been able to displace it or secure this much coveted prize. This is due to the fact that for ten years the Underwood Typewriter Company was the sole advocate of the front stroke visible principle. During this time all of the best basic ideas embodied in the principle of front stroke visible writing were invented and patented, and other companies were compelled to evade these patents when it became necessary to embody the Underwood idea in order to continue their existence.

From the report of the Franklin Institute it will be seen that the Underwood represents the highest achievement in typewriter construction. The "History of the Typewriter," by Geo. Carl Mares, says with reference to the progress of visible writing: "Probably nothing in any mechanical art has been more marked than the progress of this principle, and in this respect *the Underwood typewriter would seem to deserve all the honours which naturally fall to the successful leader of a revolution.*" Comments concerning machines that follow are made for verification and historical information.

When the Underwood was first placed on the market, its many superior advantages were immediately recognized by an exacting, critical public. As it grew in favor it became the target of all competition, against which they hurled the most absurd and ridiculous criticism and pro-

test, because it embodied the first radical departure from the primitive principle embodied in the first practical typewriter.

This strenuous opposition, however, only served to stimulate the determination of the manufacturers, for it demonstrated that competition recognized in the Underwood a most dangerous foe. Besides, in their excessive zeal to control the typewriter situation by discouraging the progress of the Underwood, circulars were issued to their managers and salesmen pointing out the defects, both real and imaginary, which as a matter of course fell into the hands of the Underwood manufacturers, and served as a guide for further refining and perfecting the machine.

Encouraged by the success of the machine and the vigorous, energetic opposition of competition, the manufacturers have exerted every effort that energy, genious, mechanical skill, and unlimited capital could command, in continuing the highest state of perfection possible in the construction of the typewriter.

The opposition to visible typewriting by some of the older companies is clearly demonstrated in their attitude as expressed in the following circular letter, dated October, 1904, sent to branch managers and salesmen:

"We are fully aware that there is a large demand for visible writers, and that this demand appears to be growing. We are not asleep. It is our business to keep posted about the wants of the public, but it is also our business to safe-guard ———— reputation and to discriminate between passing fancies and things that have come to stay. The ———— can take no liberties with its reputation. To put our name on any visible writer that has yet appeared would be taking such a liberty.

We are and always have been experimenting along new lines. We have experimented with visible models for the past five years. We are seeking one worthy of the name ————, but we are no nearer having it today than we were five years ago. We may be no nearer having it a year hence than we are today. We may never

have it. But, if not, no one else shall. If and when it does appear it will be ours. We now have several models that would tickle the fancy of novices, but we have none and have seen none good enough to satisfy the vast army of experienced operators or to satisfy the man whose money pays for the machine, and it is by catering to these two that the name '————' had become great. The machine that can successfully challenge ———— supremacy has yet to be heard from.

A visible writer may be the machine for the future, but that fact has yet to be determined. When it has been determined, the best machine of that kind will bear the name '————' no matter what it costs. Meantime, with a factory working night and day, and many thousands of machines behind orders, and a yearly increase which is greater than the total business of any visible writer, we view with comparative complacence the trade that such machines are securing, because we do not consider it lost. Only a part of it ever was ours, and that has merely strayed away. We, too, are getting much of the benefit of their work today.

We are used to 'bugaboos.' We have been through the 'shiftless machine scare,' and the 'wheel machine scare,' and the 'ribbonless machine scare,' and the 'electric machine scare.' All of these '———— annihilators' in their time looked dangerous. Where are they today? Of course this one may be the exception. But it, too, may fail. If it does, we shall have avoided its error and enjoyed our success without interruption; but if, on the other hand, it ultimately succeeds, we shall gobble up its success. If time proves their doctrine to be right, we shall get the benefit of all their work, for you know, and we know, and every one knows, that if the ———— ever does put out a visible writer, the virtue of its name, the reputation of its house, and the size and effectiveness of its organization will enable the ———— army to take by storm every stronghold that these feeble fellows have set up. We can do these things because of our power; but our power is because of our reputation, and our reputation is because we are right, and it lasts because we don't trifle with it. The name '————' on any one of a dozen visible models of today would make an immediate success—a temporary success. But what then? We contemplate no such suicidal policy. It would be an abuse of the confidence of the public, which confidence is based on the fact that the ———— name-plate has meant for thirty years the best there is. The machine to which the name is attached has always been the best, it today is the best, and it always will be the best, whatsoever model that may be."

L. C. SMITH & BROS.' TYPEWRITER

L. C. Smith, the leading power in promoting the Smith Premier, and active in the formation of the Union Typewriter Company, was the first member of the latter company to openly recognize the absolute demand of the public for visible writing. As a result he sold his interest in the Smith Premier Company to the Union Typewriter Company and organized the L. C. Smith & Bros. Company, for the purpose of building a front stroke visible typewriter, which the Underwood had already demonstrated to be practical.

This company established a unique reputation for itself by building a sales organization several months before it had built a machine for sale. In other words, they opened splendidly equipped offices in many of the principal cities of the United States before they had a machine to show or deliver. This, however, served its purpose as a medium of advertising, because it kept the public on the tip-toe of expectation, and when the machine did appear, it was already well-established in the minds of buyers and typists. But in this case the realization did not satisfy the anticipation, because the first models of the L. C. Smith, like all new machines, were in a crude, experimental stage, and as the public had already learned what it wanted, the defects in principle and construction were quickly disclosed. This caused an immediate reaction, which served an excellent purpose by forcing the manufacturers to make some radical changes in refining and improving the machine.

As a result of the reputation the Smith Brothers had gained as manufacturers of the Smith Premier, and their liberal policy, together with the refining effects on the new machine, the L. C. Smith & Bros. Typewriter soon secured quite a following.

The production of this machine confirmed and emphasized all the claims of the Underwood, and such other improvements as were made were along the lines already incorporated in the machine which had established the front stroke visible writing principle.

The L. C. Smith Typewriter has an attractive appearance in design and finish. The typebars in the first machines had what the manufacturers were pleased to call in their literature "The pivot-and-side-wall typebar bearing, a distinctive feature, unique to this machine, which allows greater play to the typebar (combined with an absolutely accurate throw) than any other typebar construction. In it the problem of 'permanent alignment,' which has always vexed typewriter manufacturers, has been completely solved. The alignment of the L. C. Smith & Bros. Typewriter is POSITIVE and it is PERMANENT!"

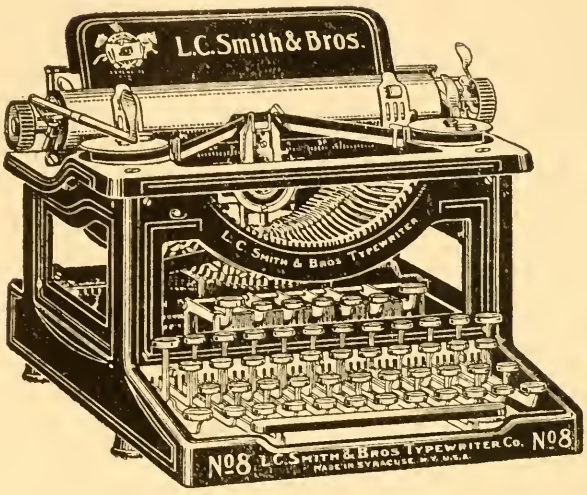
Regardless of the foregoing broad statement, in 1907 they discarded this "distinctive feature, unique to this machine," and built a machine with what they term a "ball-bearing, long wearing typebar." This feature they today make much of, but in order to control the typebar at the printing point they adopted a type-guide. This guide, however, is not very effective, as the L. C. Smith is a basket shift machine; that is, all of the typebar mechanism is shifted instead of the platen, when capitals and other upper case characters are required. This also makes it necessary to shift the guide, which cannot be done with as little wear and the same degree of accuracy as the platen shift. The printing point on the platen is a little back of the perpendicular of the typebar bearings, and as a result the typebars do not recover as quickly as the typebars on the Underwood, which do not pass the perpendicular and are compelled to return immediately by the reaction of the universal bar.

The typebar of the L. C. Smith, in its action from the position of rest to the striking point, where the impression is made, describes a quarter of a circle. In other words, it makes one-quarter of a revolution then drops back into its original position. It is just as far from the position of rest to the striking point as it is from the striking point to the position of rest, and as the typebar does not make a complete revolution it was found that the balls in the bearing returned to their respective positions. To prevent this the number of balls in the bearing was reduced from sixteen to fifteen, thus leaving the space of one ball, which allows the balls to advance just one space each time the typebar strikes.

Including the balls there are eighteen parts to each typebar bearing; there are forty-two typebars, which makes a total of *seven hundred fifty-six parts in the bearings of all of the typebars,* while in the Underwood there is just *one part to all* the typebar bearings. Exclusive of the bearings already explained, the typebar combination consists of the typebar, the finger key lever, the lower connecting link, a sub-connecting link, and a collar or sheave between the main connecting link and the finger key lever —five separate and distinct, active parts as compared with three on the Underwood.

For years this company opposed a type-guide; they decried the necessity of protecting the type face; they also advocated the right-hand carriage return, but in their latest models they have adopted a type-guide, a means to protect the type, and a left-hand carriage return (the latter if desired), all of which features were original with the Underwood. This company has brought out a number of models, the latest being the No. 8, for which they claim the principal advantage is that it makes less noise than their former product. This is true, but the changes necessary to produce this effect have not met with the

satisfactory results anticipated by many formerly satisfied users.



L. C. SMITH

The death of L. C. Smith, several years after the machine was placed upon the market, had at least a temporarily detrimental effect upon its development and progress, as the organization seemed to show the lack of his aggressive, determined disposition. L. C. Smith did much for the typewriter business, and his death was a blow to the entire industry.

MONARCH

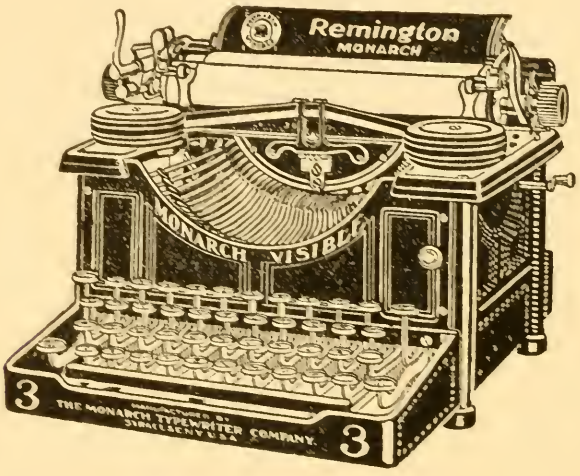
The withdrawal of the Smith Brothers from the Union Typewriter Company and the announcement of their intention to build a visible typewriter created consternation in the ranks of the Union Typewriter Company. This company immediately began to dig up "visible models" with which they had been "experimenting for the past five years" in order to forestall the Smith Brothers in their new enterprise.

The Monarch typewriter was the result of these efforts. It was thought by many that the first Monarch was not intended to be a success, but rather to try out the "visible experiments" of the Union Typewriter Company, and in the meantime hold the trade until they were able to produce a better machine, or through the Monarch discredit visible writing. It appears, however, that they builded better than they knew, because the Monarch typewriter was received with considerable favor, and it served at least to prove, rather than disprove, the demand for visible writing, and that the machine possessed more merit than they had anticipated.

This machine appeared on the market in 1904, and marked the beginning of the end of the "blind" writer, because as later developments proved, the Union Typewriter Company immediately began remodeling the Remington, the Smith Premier, and the Yost typewriters, transforming them into visible writers. As a result the only feature recognized after the transformation was the name-plate. This placed the Union Typewriter Company in a unique position—that of holding on to the "blind" principle with one hand and building a visible machine with the other, because both were controlled by the same capital and directed by the same management—one group of salesmen advocating visible writing and another denouncing it.

The typebar mechanism of the Monarch typewriter is quite complicated, there being ten separate parts as compared with three on the Underwood. (See typebars.) The universal bar adheres to the old Remington principle; that is, it is beneath the machine, and is operated by the finger key lever. This method of transmitting power results in much lost motion. The typebar bearings are of the pivotal character and necessarily wear unevenly on the side bars. The machine is not supplied with a guide, and the alignment shows the lack of support of the bar at the

printing point. The typebar proper is so constructed that it requires a little spiral spring to aid the bars to return promptly from the printing point, and to prevent shadowing. These springs are attached at one end of the back of each bar and to the segment at the other. They are necessary, not only to get one bar out of the way of the other at the printing point, but to prevent the rebound of the bars when they return to their position of rest in the basket.



MONARCH
FIRST VISIBLE PRODUCT OF THE REMINGTON

The Monarch typewriter is also a basket shift machine like the L. C. Smith. It has a left-hand carriage reverse and many other features common to the Underwood. The claim of the manufacturers is that there is no bar or obstruction whatever in front of the machine to prevent the typist from seeing all of the work. This, however, necessitates placing the marginal stops in the rear, and otherwise inconveniencing the typist. Besides, the top front bars on the Underwood and L. C. Smith do not interfere any more with the vision of the typist than does the space bar in front of the keyboard.

SPEED AND ACCURACY CONTESTS IN TYPEWRITING

Typewriter competition had become so active, and opposition to the front stroke visible machine so pronounced, that the manufacturers of the older "blind" machines sought to prove the superiority of the principle of their product by arranging a series of typewriter contests. It is believed that this action was largely for the purpose of discrediting the front stroke machine, the typebars of which were encompassed within the space of less than a half circle, whereas the typebars in the blind machine occupied a full circle. The first of this series of contests, which have been kept up continually since, took place March 20, 1905, in Chicago. The Underwood did not enter.

To force the issue, however, and bring the Underwood out, another contest was arranged in the same year for October 31, held in Madison Square Garden, New York City. The one hour dictation contest was won by Miss Mae Carrington; Miss Rose L. Fritz, then just out of school, second, both using Underwood typewriters. This was a blindfold championship contest. For the American Typewriting Championship (copying) two elimination contests were held, one for five minutes and the other for ten minutes, Miss Rose L. Fritz winning both, using the Underwood; Mr. Paul Munter, second, using the Remington; Miss Mae Carrington, third, using the Underwood; and Mr. Chas. M. Nelson, fourth, using the L. C. Smith. In both of these elimination contests the typists stood in the same order, Miss Fritz winning at the rate of 73 words a minute, and Mr. Munter, her nearest competitor, at 59. In the final thirty minute contest, however, Paul Munter was first at 70 words a minute and Miss Fritz second, at 69 words a minute.

Fixed rules at that time, however, had not been definitely established, and Miss Fritz lost the first position only because she repeated 23 words for which she was penalized five words for each word repeated. Even with this penalty Miss Fritz lost by only 15 words, when in fact she had written *correctly* 100 *more words than her nearest competitor.* Today, according to the revised rules of 1917, a typist is not penalized for a repetition if it does not contain an error.

In 1906, Office Appliances, in order to promote an unbiased interest in these contests, offered a cup, which was to become the personal property of the winner in three consecutive contests. This was first competed for in Chicago, March 23, 1906, and won by Miss Fritz, using the Underwood, at the rate of 76 net words a minute; her nearest competitor, using the Remington, wrote 64 words a minute.

On November first of the same year, 1906, this cup was again competed for in Madison Square Garden, New York, and won for the second time by Miss Fritz at the rate of 82 net words a minute.

In 1907, March 21, in Chicago, this cup was won for the third time by Miss Fritz with a record of 82 net words a minute, the cup thereby becoming her permanent property.

In the meantime such interest had been shown by so many manufacturers, such as the Underwood, Remington, Monarch, Fay-Sho, Smith Premier, L. C. Smith, Fox, and other typewriters, all of which had taken part in the contests, that Office Appliances, a magazine published in Chicago in the interest of office efficiency, conceived the idea of offering a permanent trophy on a broader basis. In other words, they took steps to arrange for a World's Typewriting Championship Trophy, to be competed for annually in New York. The World's Championship title

$1,000.00

INTERNATIONAL TYPEWRITING TROPHY WON ELEVEN SUCCESSIVE YEARS BY TYPISTS USING THE UNDERWOOD

was to be awarded the winner and his name engraved on the cup, which was to be held in trust from one contest to the next by the company manufacturing the machine on which it was won. They submitted their proposition to all of the leading typewriter companies, who not only gave their approval but subscribed to a fund for purchasing this cup, which was specially designed and manufactured at a cost of more than a thousand dollars. The contests for this cup were open to typists of the whole world.

Experience had demonstrated that the rules governing these contests should be revised to cover every error, whether mechanical, mental, or physical. A mechanical error is due to the failure on the part of the machine to respond in any way, such as piling, crowding, skipping, breaking, etc. A mental error is a failure on the part of the typist to read copy correctly, a repetition, an omission, or the improper division of a word at the end of a line. A physical error is a misstruck key, failure to return carriage to zero to begin the line, misuse of shift key, incorrect spacing (either physical or mechanical), etc.

The World's Championship Cup was competed for the first time in Madison Square Garden, New York, October 17, 1907, and was won by Miss Rose L. Fritz at the rate of 87 net words a minute; Mr. H. O. Blaisdell, second, writing 83 words a minute, both using the Underwood; Emil Trefzger, third, using the Remington.

In 1908, October 22, at Madison Square Garden, New York, this International Trophy was competed for the second time and again won by Miss Fritz at 87 net words a minute, using the Underwood.

In 1909, September 30, at Madison Square Garden, New York, Miss Fritz, using the Underwood, won the cup for the third time at the rate of 95 net words a minute.

In consequence of Miss Fritz having won the World's Championship Trophy three successive times, and about thirty other championship medals and prizes, her services were in such demand all over the world that she had to abandon contest work for the purpose of giving exhibitions, which she did, not only in the United States and Canada, but all over Europe. Miss Fritz was the first to demonstrate the infinite superiority of touch typewriting over the old sight, "hit and miss" method, and her pioneer work in the practical development of typewriting cannot be over-estimated.

In 1910, October 27, at Madison Square Garden, New York, this World's Championship Trophy was won by Mr. H. O. Blaisdell, using the Underwood, at the rate of 109 net words a minute.

In 1911, October 26, at Madison Square Garden, New York, Mr. H. O. Blaisdell again won the contest for the World's Trophy at the rate of 112 net words a minute, using the Underwood.

In 1912, November 12, at the 69th Regiment Armory, New York, the World's Typewriting Championship Trophy was won by Miss Florence E. Wilson, using the Underwood, at the rate of 117 net words a minute; Emil A. Trefzger, who had joined the Underwood forces, second, with 116; H. O. Blaisdell, also using the Underwood, 115.

In 1913, October 21, at the 69th Regiment Armory, New York, the World's Typewriting Trophy was won by Miss Margaret B. Owen, using the Underwood, at the rate of 125 net words a minute. The second, third, fourth, and fifth positions were held by typists using the Underwood.

In 1914, October 26, at the 69th Regiment Armory,

Miss ROSE L. FRITZ
FIRST WINNER OF THE INTERNATIONAL TYPEWRITING TROPHY
WHICH SHE WON IN 1907, 1908 AND 1909.

New York, the World's Typewriting Championship and Trophy were won by Mr. E. A. Trefzger, using the Underwood, at the rate of 129 net words a minute, with the next four positions held by the Underwood, the sixth position going to the Remington.

In 1915, October 25, at the 69th Regiment Armory, New York, Miss Margaret B. Owen, using the Underwood, again won the World's Championship Trophy at the phenomenal rate of 136 net words a minute with only 42 errors.

In 1916, October 16, Miss Margaret B. Owen, using the Underwood, again won the World's Championship Trophy, breaking her previous record by writing 137 net words a minute. A photographic reproduction of a part of Miss Owen's work in this contest appears on the following page.

In 1917, October 15, at the 69th Regiment Armory, Miss Margaret B. Owen, using the Underwood typewriter, won the World's Championship for the fourth time at an increased net rate of speed, breaking all previous records, writing 143 net words a minute. This demonstrates that Miss Owen is today the undisputed World's Champion Typist.

Miss Owen appreciates the value of accuracy, and her records have been made because of the fact that she does not sacrifice accuracy for speed. She knows that a business letter that is written at a very high rate of speed, filled with errors, will be returned because the business man, in attaching his signature to a letter containing errors, assumes all responsibility for such errors.

In this contest Miss Owen wrote two full pages with but two errors, one on each page, copy of one of which is shown on page 93. This copy is reduced to fit the page of this book.

I am not going to tell the story of that day; it is enough to say that the fire spread and quite a section of the city was burned. It was ten o'clock that night when I knocked at the door of the house where I boarded and they would not let me in because the landlady did not know me. Small wonder for that for when I left home I had seen her peeping out through the blinds to admire my uniform, but when I came back there was nothing of the dude in my makeup. A red hot shingle had hit me on one side of my face and singed off much of a fine head of hair and a fairly good moustache; other embers had found a resting-place on my frock coat and lavender trousers and my attire was as full of holes as a sieve. I had gotten in the way of streams of water from the hose, and all in all I was not nice to look at. All this I had to explain to the lady of the house through a crack in the door and when at length she had come to know that I was not a tramp she let me in. I went up to my room and

International Contest
Oct 16, 1916.

O.K.
Owen.
M Kimball

Miss MARGARET B. OWEN
WORLD'S CHAMPION TYPIST
AND
PRESENT HOLDER OF THE INTERNATIONAL TROPHY
WHICH SHE WON IN 1913, 1915, 1916, 1917.

PRESENT RECORD 143 NET WORDS A MINUTE.

state so far as I have known him, his voice is like that which you would imagine might come from the bottom of Hades when the lid is off and there is a row going on down there. All these talents, as you will see, place him in a class by himself and he is the very last word so far as cats go.

It was a thing like that which raised the hair on the back of Ruin and which lay on the limb of that big pine just ahead of us. Had we gone on our way and taken no notice of him I doubt if we should have heard anything from him for he was wise enough to know that while he might damage us in a rough and tumble fight yet in the long run the two of us would be too many for him. But we did not go on for Ruin and I were of one mind, we would have a round with that bobcat let what would come of it. It was the open season for game and as a rule I carried a gun with me and had fairly good success with it but I had not taken it that morning as we had planned a final hunt for the afternoon and wanted to finish our work and get back to camp as soon as we could do so. I looked about for a stick or stone but could find none and so I walked on a few steps at a time and Ruin did the same, always with one eye on me and the other on the cat, until we got to within forty feet of the pine. Ruin was no coward and I knew that he wanted to come to hand grips with the cat but I also knew that at best the dog would be torn more or less to tatters and I did not want that for he was ragged enough as he was without any additions. We crept on, our feet making no noise on the soft carpet of pine needles and the only sound that broke the stillness was a soft hiss from the cat or a low growl from Ruin. When we reached a point about thirty feet from the tree the cat no doubt thought of the maxim I have quoted, for giving vent to one last spit he jumped free and clear twenty feet from his roost and was off in long leaps as fast as his legs would carry him, with Ruin close behind him and filling the air with his short yelps.

I went back and got my transit and then made my way to where the boys had driven the last stake in our survey; it was at the highest point on the mountain and as we got our tools together we could hear Ruin on the track of the cat as the latter tried to throw the dog off the scent by running around the hill. We hid our stuff under a bush for we could come back and get it later, whereas the cat must be looked after at once if we wished to look after it at all, and we wanted to be on the job if Ruin should catch up with the beast for we knew the dog would tackle an elephant when he got his mad up and we also had some idea of the kind of

Miss Owen, Lit. Contest-1917.
O.K. J.M. Kimball

No mention thus far has been made of the Amateur Championship, which differs from the Professional only in point of time, the Amateur being for one-half hour and the Professional for one hour; both, however, being written from the same copy at the same time.

Mr. George L. Hossfeld, winner of the Amateur Championship contest in 1917, established a record which justifies mention, because it proves the possibilities of the typewriter. Mr. Hossfeld, using the Underwood typewriter, wrote 145 net words a minute for thirty minutes. This means after five words had been deducted for every error. In winning this championship Mr. Hossfeld wrote at the rate of 152 words a minute, one page of which is without error. In other words, for over four minutes he wrote at the rate of 152 words a minute, perfect, which is the highest record ever made in open competition even for one minute only. The reproduction of Mr. Hossfeld's work, bearing the signature of approval of Mr. J. N. Kimball, Contest Manager, appears on page 95.

Thus for eleven consecutive years, typists using the Underwood have won and held the World's International Trophy, purchased by all the typewriter companies and offered under the auspices of Office Appliances. The rate of speed attained in these contests has been nothing short of phenomenal. Exclusive of the return of the carriage, which was more than five hundred times, not including the shift key for capitals and other upper case characters, and not considering the insertion of sixteen sheets of paper, and turning twenty-five sheets of copy, the typists have written at the rate of more than eleven strokes per second for three thousand six hundred consecutive seconds.

Emil A. Trefzger, winner of the first endurance contest held in Chicago, March 20, 1905, writing 90 minutes from copy and 90 minutes from dictation at the rate of 62 net words a minute (only one word being deducted for every four errors), used the Remington typewriter.

to blows if it had not been that at meal time we could let off steam by finding fault with the cook. How grouchy we might all have become is a matter for conjecture but for one saving grace, the dumb friend of man which is ever at his elbow, or to speak by the card which is ever in his pocket--which soothes him in hours of pain and calms him in times of anger, and more than all, being often in his mouth shuts off impious comment--his pipe. I do not know how many of you have what our forefathers were wont to call the filthy habit of using tobacco, but I do know that such of you as have that habit will be of one mind with me when I say that there are many things in this old world of ours which I would be willing to dispense with before I would part with that bit of briar wood and its amber stem. Of course during the two days I speak of we had eaten, and we lingered at the table just as long as possible to pass away the time, but three meals a day were all that were allowed us by the rules and if we had tried to break those rules the cook would have resigned and left us to starve; but there was no rule as to our pipes and that we made the best use of them you may be sure. And all the time it rained cats and dogs as the saying is, and as I think it must have rained when Noah first shut the door of the ark and made things snug and trim for his voyage, and now at the end of the second day, the supper dishes having been taken from the table and washed by Dan whose turn it was at the time, each of us sat with his pipe in his mouth and puffed away as if for dear life. It was early in September and the weather was not cold but the blaze of the open fire felt good and gave an air of cheer to the room as night came on. When it was fine outside we used to group about the door at night and after we had made our plans for the next day we would sing and spin yarns and watch the stars as they came from their hiding places in the sky, or listen to the call of some night bird in the depth of the wood; but after two days in jail one does not care to plan for the morrow and has no mind to sing unless it be a dirge, and as for story telling, at such a time one could not tell the truth if he tried--and so we sat there each of us as dumb as an oyster and as silent as a clam. When the fire got low one of the boys, we called him "Beef" because of his size, was elected to go out and bring in an arm full of wood from the pile which we kept dry in the shed and when he came back and sat down in a chair the water ran off him and made pools on the floor in which Dick proposed that we go fishing, but the joke, if it was one, fell flat.

Geo. L. Hossfield, International Typewriting Contest, 1917 – O.K.

Mr. Trefzger continued to use this machine until the year 1908, when he began using the Underwood. The following year, operating the Underwood, he competed in London for the English Championship, and won the contest regardless of the unusual conditions imposed, which consisted in copying twenty minutes from printed matter, writing from dictation for twenty minutes, and copying from pen-written lithographed manuscript for fifteen minutes.

In addition to winning this contest and cup in 1909, Mr. Trefzger returned and won it under similar conditions in 1910, and again in 1912, there being no contest held in 1911. The terms of the contest were that the cup became the personal property of the contestant who won three consecutive contests. A sample of the manuscript from which Mr. Trefzger copied is given on page 97; It was required that all abbreviations be translated and written in full. A fac-simile reproduction of a paragraph of printed matter copied by Mr. Trefzger, follows:

> The Commissioners were Lord Balfour of Burleigh (Chairman) and Sir John Dickson Poynder (now Lord Islington and Governor of New Zealand), representing Great Britain, the Hon. W. S. Fielding and the Hon. William Paterson, for Canada, and Sir Daniel Morris, as representing the West Indian Colonies. In a letter of instructions addressed to the Commissioners by the Earl of Crewe (Colonial Secretary) it is laid down that the term British West Indies includes "Bermuda, the Bahamas, and British Honduras, in addition to the British West Indian Islands, as usually so-called, and British Guiana"; and the Commissioners are informed that "His Majesty's Government have undertaken that in any arrangement which may be arrived at between Canada and the West Indies due regard will be had to the interests of Newfoundland."

On / other hand, let us suppose that his neighbour "Y" at / same time invested savings to / value o £500 in 3% Corporate stock yielding a gross income o £15 per annum.

What is / contribution o these two respectively to / revenue in respect o capital increased on / one hand by thrift & fortune, on / other hand by / self-denial wh savings always more or less represent?

"X" pays nothing; "Y" pays income-tax on / interest o his savings to / extent o 15% per annum — i.e. 1/= in / £ on a gross income o £15.

WORLD'S PROFESSIONAL CHAMPIONS
WINNERS OF INTERNATIONAL TYPEWRITING TROPHY

Year.	Machine.	Name.	Gross.	Errors.	Penalty.	Net Words.	Words a min.
1907	Underwood	Rose L. Fritz	5619	81	405	5214	87
1908	Underwood	Rose L. Fritz	5838	119	595	5243	87
1909	Underwood	Rose L. Fritz	6135	84	420	5715	95
1910	Underwood	H. O. Blaisdell	6919	72	360	6559	109
1911	Underwood	H. O. Blaisdell	7077	69	345	6732	112
1912	Underwood	Florence E. Wilson	7450	88	440	7010	117
1913	Underwood	Margaret B. Owen	7925	86	430	7495	125
1914	Underwood	Emil A. Trefzger	7912	39	195	7717	129
1915	Underwood	Margaret B. Owen	8379	42	210	8169	136
1916	Underwood	Margaret B. Owen	8549	62	310	8239	137
1917	Underwood	Margaret B. Owen	8913	65	325	8588	143

REMINGTON NO. 10

The first practical typewriter was known as the Remington. This machine was introduced to a critical public nearly a half century ago. The name Remington, therefore, is recognized as the pioneer in the typewriter world, and great credit is due it for the educational work it accomplished in converting the public from criticism to appreciation of the value of the typewriter. The success of the Remington typewriter, the evolution of which was stimulated by various imitators, was so marked that its manufacturers were loath to abandon the understroke principle of the blind writer.

For many years the Remington enjoyed the distinction of being the best typewriter, not only because it was the first, but because it actually led in all essential requirements possible in the manufacture of the blind typewriter. After the public had become educated to the value of the typewriter, however, many users of the machine saw possibilities of improvements and suggested many, principal among which was visible writing. Although numerous suggestions were adopted, that of visible writing was deemed impractical from the manufacturers' standpoint, because it required so many changes in the formation of the machine; in fact, a complete remodeling.

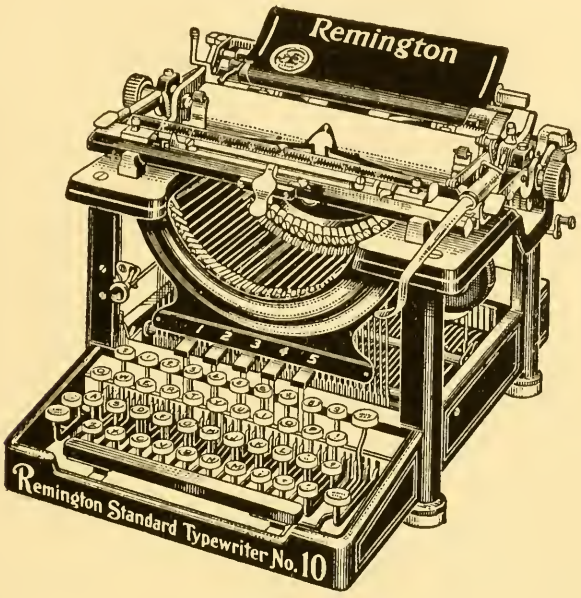
The desire of the typist for visible writing, however, finally developed into an actual demand, to which the Underwood and other machines had already responded. The success of the visible writer was so marked and the confirmation by public opinion so pronounced that the Remington typewriter was finally compelled to surrender, and reluctantly accept and advocate the principle it had so strenuously opposed for so many years.

The name "Remington" in the typewriter world had become famous, and the anticipation following the announcement of a "visible writing Remington" was the cause of much speculation. But the Remington Company had opposed the demand of typists and the business public too long, and as a result, when they were compelled to accede to the demand for a visible writer they found that the most practical features required in such construction had already been employed, and their effort to evade infringement necessarily complicated their machine.

After the Remington had "seen the light," and the transformation had taken place, there was little left by which it could be identified except the name-plate. The typebar combination, instead of being simplified was more complicated, employing about double the number of parts, and the frictional points increased from three to five. Steel finger key levers were substituted for the wooden levers of which they had made such a strong feature in their blind writers. The power was no longer transmitted direct from the finger key lever through a single connecting link to the typebar, but through a connecting link to a bell-crank, thence through another connecting link to the typebar. This increased lost motion, and resulted in less speed in the return of the typebar, to overcome which, in fast writing, it was necessary to employ a part known as the "repulser."

As has been stated before, it is not the purpose of these steps to point out defects or deficiencies in any typewriter, but rather to direct attention to all important feaures that mark an advance in the evolution of the typewriter. Inasmuch, however, as the Remington Typewriter Company claim a "new self-starting Remington," it may be interesting to the reader to know the truth concerning this. In the first place, they have built no new model since 1908. They have simply recognized and tried to cor-

rect mistakes in their original visible model. The "self-starter" is not a new feature, as it was embodied in the first No. 10 Remington typewriter in 1908, but it was then called the "column selector."



REMINGTON No. 10

It is true, the No. 10 Remington has been improved since it was first submitted to the public. For example: Their first machine had the double wheel escapement with a single loose dog. This was soon found to be impractical, and they returned to the time tested principle of the single wheel and two dogs. Both dogs, however, are loose. They also made many other alterations, among which was the change in name of "column selector" to "self-starter." This term, popularized by the automobile industry, was appropriated by the Remington simply as a catch phrase. The machine does not have a self-starter; it starts the same as all machines—by a touch of the finger—and the feature to which they give the name "self-starter" is in fact a self-stopper, but this name being literal is too

significant. It matters not, however, whether it be a column selector, self-starter, or self-stopper, it embodied the principle of the Gathright Tabulator patents which were owned and controlled by the Underwood, and could only be used by other machines on payment of a royalty to the Underwood until the patents expired. (See tabulators.)

The transformation of the Remington from a blind to a visible writer definitely and conclusively confirmed all the claims of the Underwood, which not only served to establish the latter machine more firmly in the estimation of the public, but to acknowledge its leadership in the typewriter world.

SMITH PREMIER NO. 10

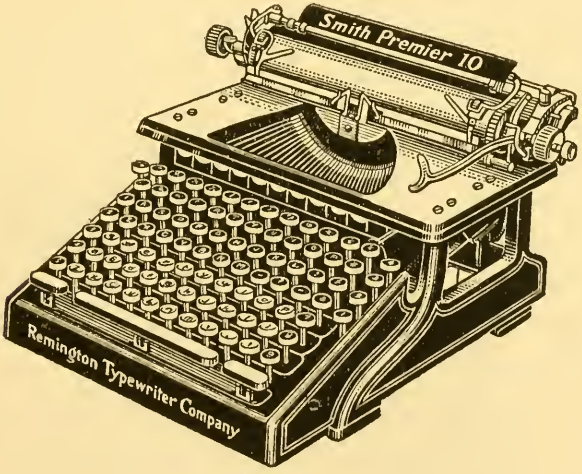
The federal laws restricting trusts and other combinations apparently made it necessary for the Union Typewriter Company to claim its own, and sell its products from one general headquarters, and not from different points apparently in competition with each other. The Remington, the Smith Premier, and the Monarch were therefore brought together, and the Smith Premier of necessity was also transformed into a visible writer.

The first model of the Smith Premier Visible was, as all first models are, very crude, and some vital changes were necessary, one of which was the so-called "target," which actuated the escapement. In other words, the universal bar was brought up to the type end of the typebar. Theoretically, this was good, but practically it was not a success, and as a result it became necessary to change the position of the universal bar.

The Smith Premier as a blind machine had doubtless the best method of cleaning the type, but the visible Smith Premier has possibly the most difficult method of cleaning the type—they are hard to get at with the brush; besides, there

are two sets. The ribbon is very difficult to place in position. The machine, however, recognizes and emphasizes the value of visible writing.

The No. 10 Smith Premier has no special advantages over the old blind model except the visible feature which the evolution of the typewriter forced it to adopt. It still has the double keyboard, which compels a change in the bearings to accommodate them to the reduced space on a front stroke machine. It now has ball-bearing typebars, and being a Remington product, this places the company in a position that is quite inconsistent, that of advocating three different styles of machine—the Remington, with pivotal typebar bearings, a single keyboard, and carriage shift for capitals; the Smith Premier with ball-bearing typebars and a double keyboard (a key for each character); and the Monarch with a single keyboard and basket shift for capitals.



SMITH PREMIER No. 10

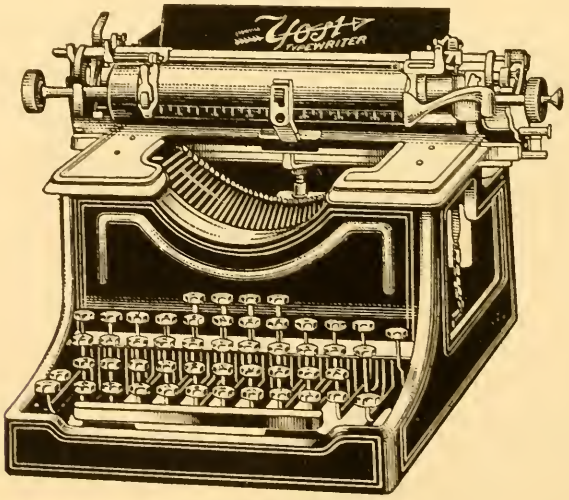
To further accommodate the typebars of the Smith Premier to the space allotted them, it is necessary to make them in two lengths, the short bars being hung three-quarters of an inch above the lower or long bars. In

order to equalize the touch and impression, the type on the short bars should be made heavier. This is not the case, however. The power necessary to operate the type-bar embodies the same principle as that of "horse power," the universal term used in mechanics, which includes force, distance, and time. To equalize the time, which is the most essential, the leverage in the two sets of bars must differ, which affects the touch, or power, and speed according to the principle involved in "horse power."

The Smith Premier is no longer popular among the best typists principally because of its double keyboard, which is an objectionable feature for touch typewriting, the method almost universally taught in schools at the present time. It is only the older and slower operators who use the sight method in typewriting, and to these the evolution of the typewriter would not appeal.

YOST MODEL A (Visible)

The Yost typewriter, being a member of the Union Typewriter family, immediately followed suit in changing



YOST MODEL A

its blind machine to a visible writer. The result of their effort to retain some of the features which the Yost had employed in the blind writer is really interesting, not on account of its efficiency, but as an example of mechanical possibilities. The typebar combination requires fourteen separate active parts. The inventor must indeed have had a wonderful mind to solve a problem involving such marvelous intricacy. (See diagram, page 140.) There are ten frictional points in this typebar combination, which is one of the most complicated of any machine.

The blind Yost typewriter was a pad machine, and this feature is retained in the visible. In order to do this it is necessary for the type to lie face down on the pad directly beneath the writing line, exposed to all the erasure and office dust. To lift the type from the inking pad, or position of rest, to the point of contact with the paper, where the impression is made, four definite and distinct movements are necessary. The type are lifted up, back, up, and forward to the printing point. The typebar itself, as may be seen, is composed of three parts, one of which holds the type, and another serves both as a lever and a hammer to lift the part holding the type and to strike it in the back to make the impression. On account of the position of the type lying face downward, it is extremely difficult to clean them.

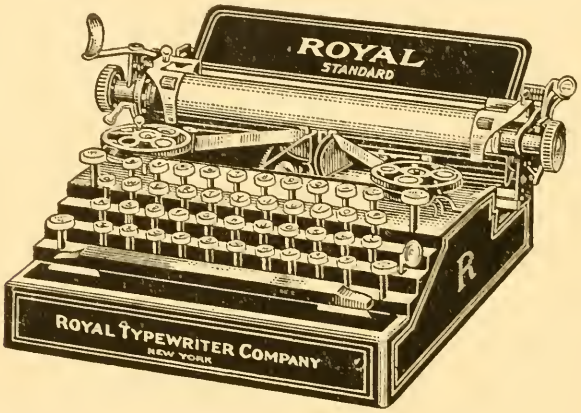
It would be difficult to even attempt to describe the complexity of this typebar construction, or any other features of the machine, except that it changed from a blind to a visible writer, and from a double to a single keyboard. Suffice it to say that the machine marks no step in the evolution of the typewriter, hence it could not find a market in the United States, and practically the entire product is consumed abroad.

ROYAL

The Royal typewriter is a machine with a checkered career. Its first appearance on the market was in 1906,

and it was current comment at that time that the machine was designed and built for the purpose of forcing a further combination of typewriters, which the Underwood had practically succeeded in breaking up. It was not successful, however. It did not possess sufficient merit at that time to attract public attention to the extent that it would disturb other manufacturers.

Two models were built, one known as the Royal Grand, and the other the Royal Standard. The former sold for one hundred dollars, or at least it was so listed, but for reasons best known to the manufacturer it was soon withdrawn from the market. The latter, however, was continued at a list price of sixty-five dollars.



ROYAL STANDARD

The company adopted a very suggestive slogan, "You can pay more, but you can't buy more." The price and the aggressiveness of the company attracted some little attention. It was found, however, that a typewriter of quality could not be made and sold at a price less than one hundred dollars without loss to the manufacturer. The result was, the company built another model, No. 5, in which were incorporated the back-spacer, the tabulator, and the bichrome ribbon, and increased the price to sev-

enty-five dollars. These added features already being in use on all the older machines served to discredit their slogan. Still this machine did not measure up to the requirements of either the typist or the business man, and another change became necessary.

This time the machine was changed in form, model, and price. It was built higher to conform, as they said, "to generally accepted appearance in typewriter construction, and would be sold at the standard price of one hundred dollars." They called this the No. 10 model, but aside from the change in form, practically the only improvement was the automatic reverse of the ribbon. The manufacturers found that changing the form of the machine and raising the price did not conform with their slogan. This had served an excellent purpose in the sale of the machine at sixty-five dollars, but it became retroactive with the change, which may account for the many reports that the company is unable to secure list price. In introducing the Royal Typewriter No. 10, through Office Appliances in the June issue of 1914, the company says:

"The introduction of the first model of the Royal Typewriter was attended by the discouragement which always follows the production of any machine, for any purpose, which does not conform in appearance with that which the public is familiar."

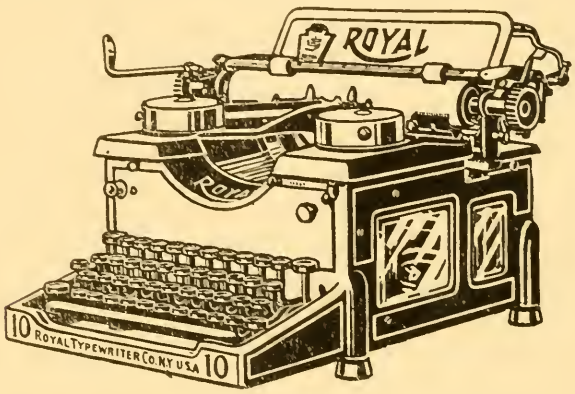
"The public, once used to a certain form, gives slight response at first to the suggestion of change. . . . But the public, although slow in response to change, *does always in good time accept* what was once considered an innovation, provided it have merit."

"When the typewriter which first put writing in sight of the operator was introduced," (the Underwood) "and which machine was essentially different from older models, the public was not so sure it wanted a machine that differed in construction from the kind to which it had been

accustomed. The machine did not look like those with which the public was acquainted. But presently the public would have no machine that did not embody the principle of the writing in sight of the operator."

"The first model of the Royal resembled no other typewriter. It did not conform to the generally accepted lines of typewriter construction, and the manufacturers had to be content with the psychological disadvantage."

From this statement it would appear that the No. 10 Royal was introduced principally for the purpose of "con-



ROYAL No. 10

forming with the appearance of other typewriters," and of enabling them to sell it "at the standard price of one hundred dollars." The No. 1 and No. 2 Royal Standards gave way to the No. 5 with an advance of ten dollars in price. The No. 5 was succeeded by the No. 10 with an advance of twenty-five dollars, catalog price. The No. 10 begins with the serial number where the No. 5 left off, and the No. 5 where the No. 2 was discontinued.

While the outward conformation of the machine resembled the Underwood, and other visible writers that had preceded it, its interior or vital working parts did not conform with those of any other machine. The typebar combination, as shown by diagram, page 136, is composed

of eight parts. The link or links connecting the finger key lever with the typebar proper has five parts, consisting of a series of bent wires. The back wire, the one that operates the universal bar, is encased in a spiral spring hooked into the frame at one end and a section of the links at the other. This is for the purpose of assisting in taking up lost motion.

The fragile mechanism of the machine is encased in plate glass. This, it is claimed, is for the purpose of keeping the dust out, but the real reason, it is believed, is to prevent the typist's cleaning brush and the inspection of the exacting buyer from getting at the frangible construction.

NOISELESS

The Noiseless typewriter is a machine that deserves mention. Of course, it is a visible machine, and it is really noiseless. But while this noiseless feature is appreciated in some offices, to secure it numerous sacrifices of other important features are necessary, which makes it undesirable in the great majority of busy business offices.

The type are arranged in a fan-like formation, three characters on each bar, and by means of an actuating arm are "pushed" horizontally from their position of rest a distance of about two inches to the printing point, and when they reach the printing point the force that impels them has been expended. There is a steel bar that extends along between the cylinder and the printing line on the paper to give a solid printing surface.

The typebars in their forward movement slide into a guide that is not adjustable, and the surface over which they slide is not only exposed to dust, but they have five frictional points which cause the sluggish return of the bars. The return of these bars on the new machine is caused

by a tension spring and a balancing weight. These must be evenly and accurately adjusted because the least tensional friction greatly retards the return of the bars.

In front of the machine there is a dial graduated from 0 to 16. On this dial there is an indicator which, when set at 0, is intended to adjust the position of the cylinder for writing on one sheet of paper. As the dial is advanced, the cylinder is forced back. This is supposed to provide for a number of sheets of carbon and to give the same pressure on each sheet from one to sixteen; but it does not, for the reason that the number of sheets serve as a cushion which prevents the final pressure and nullifies the purpose of the steel bar. This adjustment, however, prevents battering the face of the type against the steel bar back of the printing point. Because of the impression being made by a push rather than a blow, the effect is not good. A quick, sharp blow of a few ounces will produce a better carbon copy than the pressure of several pounds.

It would be difficult indeed to describe or define the typebar and its action of the Noiseless typewriter, but the reader can perhaps draw his own conclusions by referring to the diagram of the typebar on page 138. It should be remembered also that the construction of the typebar is the all-important feature of all typewriters.

The marginal stops and the tabular stops are both on the same rack in the back, and they are very inconveniently set. It is necessary to adjust them according to a graduated scale on the paper shelf, which agrees with the scale on the cylinder. These stops being on the same rack interfere with the adjustment of each other. It is often necessary to move both to adjust one.

The keyboard is not universal from the fact that it has two shift keys, one for capitals, and the other for the numerals and many of the special characters. This will always make the machine unpopular with touch typists.

The machine is very much heavier than other machines as the result of the thick casting of which the frame is composed for the purpose of reducing the noise.

The efforts of the manufacturers of the Noiseless machine are commendable, but the results will not meet the requirements of the modern business office. It is the author's contention that whatever the mind conceives the hand can execute. In other words, the conception of the mind is a prophecy of the possibility of its accomplishment. However, as with the typewriter itself, it often takes a long time for the realization of a prophecy. The mental conception of the typewriter, formulated more than two centuries ago, was in the process of evolution one hundred and fifty years before the first practical typewriter was built, and then only in a very crude form. Therefore, the noiseless machine may in time develop into

NOISELESS

a practical typewriter, but as it is today it has many difficulties to overcome, before it will meet the requirements of the exacting business public.

VICTOR

Supplementing the efforts of the Underwood in its early days to educate the business world to the value of visible writing, several machines were built along similar lines, and each served its purpose by confirming the front stroke visible principle made popular by the Underwood. Some of these machines that should be mentioned are the Secor, the Stearns, the Fox Visible, and in fact all machines that were built embodying the principle of the front stroke visible writer.

Among this number is also the Victor. The strong claim of the manufacturers of this machine is the wide pivotal typebar bearings, and in this respect the individual pivotal bearing for each typebar is wider than the bearing of any other machine with similar bearings, but it does not have any other feature that would especially recommend it. In fact, its ribbon control is crude, and is in the way of the typist. There is nothing to prevent the face of one type from striking against the back of another, which at times cannot be avoided even by the most skilled typist. The breaking or battering of the type causes irregular, imperfect impressions, and spoils the appearance of the work. This defect was provided against in the earliest model of the Underwood, but its value has only recently been confirmed by such machines as the Remington, L. C. Smith, Royal, and others.

CORONA

The purpose of this machine primarily, and it might be said finally, is portability. It is the outgrowth of the Folding Typewriter; in fact, it is a folding typewriter—the carriage and upper framework folding down over the keyboard when not in use, thus making a compact form for carrying.

The machine has a double shift, that is, one shift for capitals, and the other for figures and special characters. It is attractive, and does good work to the limit of its capacity, but its capacity is quite limited as compared with machines that are designed and built for heavy, fast office work. For the purpose, however, that it is intended, it meets the requirements quite satisfactorily. It advanced no new ideas other than the folding feature, which is essential for convenience in carrying, and to accomplish this it is necessary to sacrifice other features common on better machines.

EMPIRE

This is a machine of numerous names. It is manufactured in Montreal, Canada, where it is known as the Empire; in the United States, the Wellington; and in Europe, where it is made under license to a Mr. Adler, it bears his name. This machine is not mentioned as a step in the evolution of the typewriter because it possesses no new ideas that are especially commendable, but it has some considerable following in Canada and Europe, hence the consideration.

The typebar construction of the Empire-Wellington-Adler is peculiar and quite complicated. The typebars rest on a flat surface and are pushed forward to the printing point, a distance of about two inches, into a guide, where the type are held securely. It is claimed for this machine that it has a universal keyboard. This is not true, however, The recognized universal keyboard has a single shift, or at least two shifts, one on each side, that may be operated by either hand, but the function of both is the same, and it is not necessary to shift for figures or many of the special characters. In other words, in using all of the characters on the standard universal keyboard it is necessary to use the shift key just half as many times as would

be required in using all of the characters on the Empire-Wellington-Adler. It is claimed that the typebars do not move as far as on most other machines. This is true, but it is also true that they do not move nearly so fast because of the friction on the surface upon which the typebars rest and move, and the lack of gravitation.

It is evident that the typebar of the Empire suggested the typebar construction embodied in the Noiseless.

EDISON

The Edison typewriter was designed expressly by the manufacturers of the Edison Mimeograph, A. B. Dick Company, for the purpose of providing a machine that would cut a good stencil, and sell for less than one hundred dollars. This was an aspersion on other typewriters, especially when this company tried to enter the regular typewriter field. The machine did not possess quality, and although cheap it was expensive for the owner because it did no better stencil work than other machines, and was not equal to the requirements of general office work. Almost all machines of the day in which it was manufactured would cut a stencil quite as good as the Edison, and as a result it was soon discontinued. The fact that they tried to enter the regular typewriter field served to encourage mimeograph competition by typewriter companies who were building machines that would cut satisfactory stencil copies.

The Underwood Typewriter Company brought out the Underwood Revolving Duplicator with a full line of supplies and specially prepared stencil paper of the highest quality. This work is so important that digression is pardonable—few typists understand how to cut a stencil properly—they are too apt to give a heavy, hesitating blow when a quick, snappy, even stroke is required.

FOREIGN TYPEWRITERS

It is a strange fact that all of the best typewriters that have been produced have been built in America, and American machines find a better market in Europe and other countries than machines built elsewhere.

The style of construction of foreign machines does not fulfill the requirements of the most exacting users. They are all visible writers, of course, of the front stroke principle, but they seem to lack the refinements of the American made machine.

As this book is intended solely to record the steps in the evolution of the typewriter, the whole foreign product, of which the great majority is manufactured in Germany, may be treated under one head. There is no foreign machine entitled to recognition in this book as a step in the development of typewriters, and they are given consideration only as a matter of historical reference, as well as to confirm the front stroke visible principle introduced by the Underwood, which brought about the revolution in the style of typewriter construction, and their imperfections only serve to emphasize the superiority of the American typewriters.

This statement is confirmed by the fact that an edict was issued by the German Government prohibiting any branch of the Government from purchasing typewriters that were not made in Germany. This was necessary because the German product was lacking in quality and was not appreciated.

CONTINENTAL—The Continental typewriter is a German product, and is perhaps one of the most prominent foreign built machines, but it is crude in comparison

with the highly developed American machines. It contains absolutely no feature that is commendable by comparison with the machines already mentioned in this book.

IDEAL—The Ideal, it is said, is an American invention, but if this be true, it only proves the facts before stated with reference to the superiority of the American typewriters. It is made in Germany, for the reason that it could not find a market in the United States.

KANZLER—The Kanzler is manufactured in Berlin. This machine has eight characters arranged on each typebar. However, the keyboard would seem to be larger than the regular standard keyboard. The machine has never made any impression either in its own country or elsewhere.

STOEWER—The Stoewer is also a German machine, and other writers say that it "more strongly resembles the Underwood than any other." It is true that all machines have tried to "resemble the Underwood," but the Stoewer machine has fallen very short in its effort. This machine was placed upon the English market as the Swift, and while few changes were made they were all more in imitation of the Underwood than the Stoewer proper.

TORPEDO—The Torpedo, another German machine, has undergone several changes in its formation since it was first introduced. This machine is also built in imitation of the Underwood, although it has a right-hand reverse located very awkwardly. Nevertheless, it confirms the basic front stroke visible principle.

MERCEDES—The Mercedes typewriter is another German product, but it differs so little from the machines already mentioned that it is really quite unnecessary to make any comment concerning it. Of course, it employs the front stroke principle, as all machines built today do. A feature is claimed for this machine which is an old neglected idea first used on the Daugherty, that of inter-

changing the type by loosening a few screws, and removing the entire typebar mechanism and substituting another. This is impractical, however, because the change of type is not of sufficient importance to justify the expense and trouble.

TRIUMPH—The Triumph, another German machine, is quite on a par with those already mentioned, although to speak frankly, as is the aim of this book, it is doubtless the best one of the entire German product. None of these machines contains a single feature that has not already been incorporated in some one of the many American machines, but they have copied in a crude manner more closely the Underwood ideas, evidently recognizing its superior principle of construction.

Cuts of the foregoing typewriters would convey no information, as they all have the same general appearance and differ in no essential features from the cuts shown of the American made machines. However, the reader's attention is directed to the diagrams of the typebars in the back of the book, which show how closely they have tried to imitate the Underwood typebar action.

MASKELYNE—During the long personal experience of the author in the actual sale of the typewriter, he has been asked many times why manufacturers did not provide a means for differential spacing; that is, the regulation of the space between the characters. As typewriters are built today, it requires as much space for the "i," "l," and other letters of similar width as it does for the "m" and "w," and where a wide type character is doubled or comes together, followed or preceded by a narrow faced type, the spacing seems quite irregular. This principle in typewriter construction has not been overlooked. Various at-

tempts have been made to secure this feature, as manufacturers recognize that the work would have a better appearance if spacing could be made to suit the individual character without sacrificing other and more important advantages.

The most worthy effort in this direction was that made by the manufacturers of the Maskelyne typewriter. It provided for different spacings, one for a character similar to "i;" another for "e" and similar width; another for "m" and "w;"and still another for diphthongs. This construction necessarily affected the touch of the keys, and the action of the carriage.

In careful writing, with a desire to favor this feature of the machine, the work was satisfactory, but in fast writing the mechanism that produced this result became negligible or inoperative, and as the disadvantage was far greater than the advantage, which consisted chiefly in the appearance of the work, the idea was abandoned and the manufacture of the machine discontinued.

TABULATORS

The typewriter, for typewriting in its simplest form, having been thoroughly established, inventors were making every effort possible to improve the machine and develop its practicability. For example: The earlier typewriters were not practical for doing statement or form work; it was necessary to strike the space bar for each intervening space between various positions of writing on the same line, then lift the carriage and compare scales. This was very necessary, and work of this character could not be done with any degree of facility and accuracy.

Many attempts of various kinds and classes were made to produce a tabulating device that would be practical, but among the many only two are entitled to recognition, all others embodying practically the same principle. These are the Gathright and Gorin, the latter being an infringement on the former.

GATHRIGHT—On January 15, 1889, Joseph B. Gathright, of Louisville, Kentucky, filed application and secured patent (No. 436916), September 23, 1890, for a tabulating device. The use of this invention permitted the carriage to move forward from one position to any other desired position, skipping the regular spacing controlled by the rack, and indicated by the scale on the machine.

This device made it possible to do billing and other statement or form work easily and accurately by mechanically skipping spaces desired to be left blank. This was accomplished by touching a key that released the dogs from the rack and permitted the carriage to pass to a fixed position, where its course was arrested by a stop. The number of columns was limited only by the number of engaging stops.

For reasons unknown, this patent was not used by any of the typewriters manufactured at that time. Its value, however, was immediately appreciated by those responsible for the development of the Underwood, who secured control of the Gathright patents and embodied them in the construction of the earliest Underwood machines. This invention increased the value of the typewriter inestimably as it was the initial step to the many uses in which the typewriter has been employed in the various forms of billing, bookkeeping, statement work, etc.

GORIN—On January 3, 1895, F. P. Gorin, of Chicago, Illinois, filed application for a patent on a tabulating device, which was awarded him May 5, 1896, (No. 559449). This patent was assigned to the Remington Typewriter Company and the device sold as an attachment to their machine at a price of twenty dollars each above the list price of the machine.

The Underwood typewriter, which was first produced in practical form about the year 1896, entered suit for infringement upon the Gathright patents, and after several years of litigation, established through the courts their claim of priority as sole owners of this device.

It will therefore be understood that all mechanical spacing devices that permit the carriage to move forward any number of spaces in excess of the single regular scale space, used by all machines, whether they be called tabulators, column selectors, self-starters, or any other name, embody the principle contained in the Gathright patents, which belonged to, and was a part of, the first Underwood.

TYPEBARS

In the anatomy of the typewriter the typebar construction is the heart, and its action the pulse or power that vitalizes the entire machine. The power is transmitted through the touch of the finger key to the typebar, which makes the impression on the paper, and causes the escapement or forward movement of the carriage. To illustrate: By removing a typebar from the Underwood, then touching the finger key to which it was attached, it will be found that the machine will not respond in any particular. This is true with the Underwood only, as it is the only machine from which a typebar can be removed and replaced without loosening a screw or the necessity of readjusting the alignment. Each typebar is numbered and made to fit its position in the segment, and it fits it.

Geometry teaches that a straight line is the shortest distance between two points. The two points in typewriting are the touch and the impression—the cause and the effect—the action and the result. It necessarily follows that the best results accrue from the most direct "straight line" action. This is accomplished by the elimination of parts and the reduction of frictional points.

For the benefit of the reader diagrams have been prepared showing the construction of the typebar combination of the most prominent typewriters in use in recent years, from which he can draw his own conclusions with reference to the merit of the principle and construction. These diagrams will be found commencing on page 133.

While the typebar has been termed the "heart of the typewriter," there are other very important features that must perform their proper functions in order that the best re-

sults may accrue. It is not the work performed by any individual part, but the close direct co-operation of the many parts that contributes to the best results in typewriting.

It would be impossible to definitely describe the difference in the typebars as shown in these diagrams. It will be observed, however, that the Underwood, the first one shown, has but three active parts—the finger key lever, the connecting link, and the typebar proper. The principle embodied in this construction not only contributes to the greatest speed, accuracy, and durability, but conserves the energy of the typist. It is the quickest typebar, not only because of the fact that each individual finger key can be adjusted to suit the requirements of each individual finger of each individual typist, but because, at the instant the typebar reaches the printing point where the impression is made, it comes in direct contact with the universal bar, and the reaction of the latter causes the immediate return of the typebar. This, too, is supplemented by the bevel on the rigid dog, which prevents the slightest hesitancy in the reaction of the universal bar, which in turn acts directly upon the typebar. The accelerated leverage for which provision is made by the cam in the heel of the typebar, in which the connecting link works, increases the momentum of the typebar as it approaches the printing point, as shown on diagram, page 133.

The correct touch of an expert typist is a quick, sharp, snappy blow, releasing the key before the typebar reaches the printing point. This not only relieves the hand of the jar, but it gives the machine a chance to do its work properly. The carriage cannot go forward until the key is released.

As a concrete example: The winners of the World's Championship Trophy have not always struck more keys than contestants using other machines, but the simplicity, direct action, elimination of friction and lost motion, both in the typebars and escapement of the machines used by the

winners, have reduced the number of their errors to a minimum. Hence, it will be seen that it is necessary to have a machine that will respond to every effort of the typist in order to produce the best results, not only in winning the championship, but in all things for which the typewriter is used. These facts will be appreciated by a careful study and comparison of the diagrams of the typebars and escapements in the back of the book.

It will be observed that many of the foreign machines have not hesitated to imitate the style of construction of the Underwood typebar even more than some of the domestic machines, but the lack of harmony in the operation of the numerous other active parts renders these machines even less effective. Hence, it will be seen that the "heart" of the typewriter, though most important, is not the only vital organ necessary to the life and activity of the machine.

In the evolution of the typewriter inventors have designed machines, which manufacturers have built, with the typebars striking the printing point from all directions. From the present style of construction, however, it will be noted that the front stroke principle has been almost universally adopted by all the leading machines. The typebars lie in front and strike upward, a style first successfully used by the Underwood.

UNIVERSAL BARS

The universal bar is that part of the machine upon which the power, resulting from the stroke of the finger key, actuates the escapement, that permits the forward movement of the carriage.

There are three means or methods by which the universal bar is operated. First, by *direct action of the typebar,* without division of power, through the stroke of the finger key to the typewritten impression as shown by diagram, page 145. The second method is by the *action of the connecting link* against the universal bar, the power resulting from the stroke of the finger key being divided at that point of contact; one force operating the typebar, the other the escapement; hence a division of time in the action of these two important parts is not unusual. See diagram, page 146. The third and last style is the *action of the finger key lever* on the universal bar. This removes the power or cause farther from the effect, and often results in "skipping" or "piling." See diagram, page 146. By the last two methods it is possible for the impression to be made without the escapement taking place and vice versa. Study and compare these diagrams as well as all diagrams relating to the typebars and links.

LINKS

The finger key lever receives the blow and the typebar makes the impression, but there is a connection between the finger key lever and the typebar, called the link. The number of parts in this link-connection varies from one to many, as is shown by diagrams of four machines on pages 147 and 148.

It has been wisely said, and the theory universally accepted, that "A chain is no stronger than its weakest link." Through these links the touch or cause which produces the effect or impression is transmitted. The more parts in the link connecting the finger key lever and the typebar, the more the construction is complicated and the number of frictional points increased. This indirect action necessarily causes a loss of time and power.

It will be observed that the Underwood has but one part or link connecting the finger key lever with the typebar, and as the typebar comes in direct contact with the universal bar it more fully complies with the geometrical definition of a "straight line" than any other typewriter built. If you are interested in typewriter construction study these diagrams closely.

KEYBOARDS

Today the arrangement of the twenty-six small letters of the alphabet on the keyboards of all typewriters is practically universal, but the remaining characters, which are more than two-thirds, are arranged in three different forms. More than ninety per cent. of all machines manufactured have a keyboard with a single shift for capitals, or rather a shift key on each side of the keyboard, which may be operated with either hand, both performing the same function. The advent of touch typewriting has demonstrated that this is the best style of keyboard. It is simple, compact, and complete. Machines equipped with this keyboard are universally used in the classrooms of all high grade schools, the only exception being where a student desires to be prepared for a certain position where another style of keyboard is used. See diagram of universal keyboard, page 149.

The double keyboard has a character for each key. This style is not popular with touch typists, from the

fact that it is necessary to change the position of the hand when a capital is desired. Besides, thirty-three and one-third per cent. of all the keys, including the numerals, are operated with the little finger, as shown by figures 4 on diagram page 149.

The third style of keyboard has three characters on each key, which requires a double shift; one for capitals and the other for numerals, punctuation marks, and special characters. This keyboard is so arranged not because of any advantage it gives the typist, but for the benefit of the manufacturer, which enables him to accommodate the keys to the limit of the typebar capacity as a result of the style of construction of the machine. (See page 150.)

The diagrams of keyboards given in this book show numbers above each key. This number indicates the finger used on that key, and it refers to both hands. Number one indicates the first finger of either hand, number two the second finger, number three the third, and number four the little finger. The space bar is operated by the right thumb.

In the course of the evolution of the typewriter the keyboard itself has undergone many changes. All kinds of freak ideas have been advanced, one of which will be seen in diagram, page 150. As long as opinions differ, and certain styles of typewriter construction are continued, it will be impossible to adopt a keyboard that will be uniform in all respects. Besides, the frequent occurrence of certain characters in other languages than English necessitates certain changes in order to produce the best results.

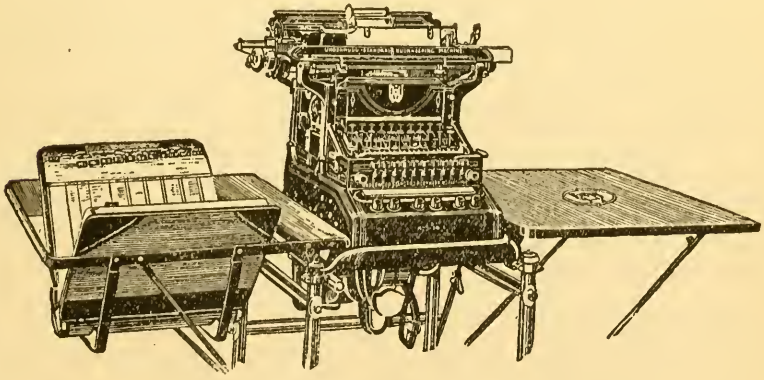
The Universal Keyboard, as indicated in the first diagram, will doubtless remain unchanged, not only from the fact that millions of typists use it and would object to a change, but all publications for the instruction of the student of typewriting are based upon this style of keyboard, which a change would materially affect.

SPECIAL MACHINES

The story of the evolution of the typewriter, so far as it relates to correspondence and general office work, has been told. But when the value of the typewriter as a general office assistant became fully appreciated by typists and business men, they began to cooperate with manufacturers to enlarge the scope of its usefulness. Inventors responded to this universal desire for the further development of the typewriter, until today there is a machine built for every purpose for which the pen was formerly used, except the actual signature, which individualizes and establishes responsibility for the work.

For example: The Underwood provides a machine for general accounting, such as ledger posting and statement work, railroad waybilling, statistical and form work of all kinds. In fact, it might truly be said that the great future of the typewriter industry lies in this direction.

BOOKKEEPING MACHINE—The bookkeeping machine enables the operator to make and prove daily all records in bookkeeping and statement work, keeping the



UNDERWOOD BOOKKEEPING MACHINE

ledger and statement of accounts automatically balanced to the minute. This eliminates the troubles common in taking off the trial balance.

ADDENDAGRAPH—The Addendagraph is practically unlimited in its capacity for statistical work. Any

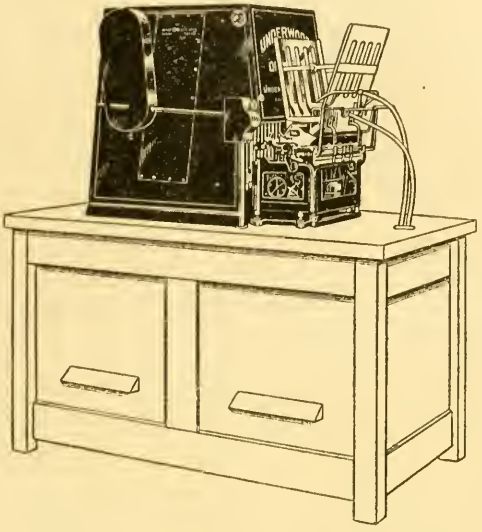
ADDENDAGRAPH

number of columns may be made to the full capacity of the form used. This machine will give the total of each column vertically; of each line in all columns horizontally; and will give a *grand total* which results in the proof of the correctness of the work.

Other manufacturers have likewise appreciated the desire on the part of the business world for using the machine in a broader capacity than its original purpose, and they too are building machines in various forms in an effort to meet this desire.

AUTOMATIC WRITER—The Underwood also builds an Automatic typewriter for circular work. This machine will write an unlimited number of copies from

the original, each having a different name and address. This original is prepared on a Master Model machine, and is a perforated continuous roll of paper, similar to the pianola record. The perforated roll containing the body



UNDERWOOD AUTOMATIC WRITER

of the letter, together with a similar roll with the names and addresses, are inserted in the machine, a supply of paper placed in a receptacle for the purpose, and the electric current turned on. The machine will continue operation until the supply of paper, which can be renewed as often as desired, is exhausted. Another advantage is the fact that the perforated roll or copy may be taken out, changes made, and preserved for future use.

During the last four decades the typewriter has evolved from an experimental, doubtful degree of progress into an intensive industry, the magnitude of which it would be difficult to over-estimate. The invested capital necessary to conduct the manufacturing end involves many millions of dollars—a multitude of the most expert mechanics are engaged in the experimental department, endeavoring to further improve the typewriter—many thou-

sands are employed in the actual manufacture of the machine—while there are armies of men all over the world employed in the sales and distribution of the typewriter—nor does this include the vast number of employes in the various offices required to keep the accounts and conduct the general office affairs of the industry. The typewriter has also contributed greatly to the world's welfare by providing employment for hosts of typists, principally young women, who have not only made themselves self-supporting and independent, but have gained a higher and truer estimate of their worth.

The Franklin Institute of the State of Pennsylvania, Philadelphia, says: "The writing machine has become indispensable to our business life."

The Shorthand Writer, edited by W. L. James, a man with an extensive knowledge of the service the typewriter renders, says: "Thomas A. Edison, no doubt the greatest inventor of all time, never invented anything more useful than the typewriter."

J. N. Kimball, Manager of the International Typewriting Contests, says: "And now one last word. I said a little while ago that the thought of Sholes had moved the world as much as it could have been moved by the lever of Archimedes, and I believe that is a correct statement. Suppose, for instance, that all the results of that first thought were banished, instantly, from the world, what would be the result? It is something worth pondering upon, is it not? In the first place, and as the most immediate disaster, thousands upon thousands would be deprived of a livelihood, people who know of no other method by which they could make a decent living. The wheels of trade would stop with a suddenness that would be appalling, and no panic that the world ever saw would equal, in pecuniary loss, the result of the withdrawal of the typewriter from commercial houses."

It would be presuming upon the intelligence of the reader, and mistaking the requirements of the business world to say that any one typewriter possessed *all* of the many excellent features known to the typewriter industry. It is, however, an indisputable fact that the United States is the great leader in the manufacture of typewriters, and the foreign made machines are practically imitations of the domestic product.

As evidence of this fact, from 1911 to 1915 inclusive, the United States exported $47,950,951 in typewriters, and in 1916, $9,104,189. There were no imports.

The Underwood typewriter is the only writing machine that has been able to place the million (1,000,000) serial number on its product, which strongly indicates its popularity.

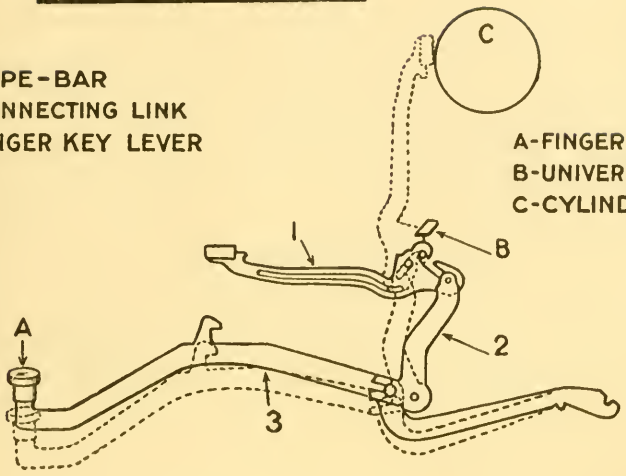
TYPEBARS

Diagrams showing number of parts, number of fractional points, position of universal bar, and principle involved in the action of the typebar.

UNDERWOOD

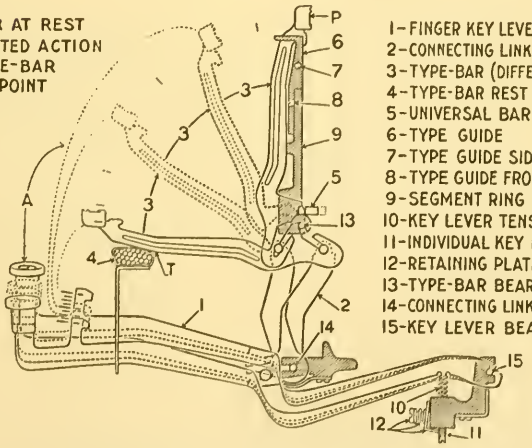
1 - TYPE-BAR
2 - CONNECTING LINK
3 - FINGER KEY LEVER

A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



T-TYPE-BAR AT REST
A-ACCELERATED ACTION TYPE-BAR
P-PRINTING POINT

1-FINGER KEY LEVER
2-CONNECTING LINK
3-TYPE-BAR (DIFFERENT POSITIONS)
4-TYPE-BAR REST (SHOT PAD)
5-UNIVERSAL BAR
6-TYPE GUIDE
7-TYPE GUIDE SIDE ADJ. SCREW
8-TYPE GUIDE FRONT ADJ. SCREW(3)
9-SEGMENT RING
10-KEY LEVER TENSION SPRING
11-INDIVIDUAL KEY LEVER ADJ. SCREW
12-RETAINING PLATE, SPRING AND SCREW
13-TYPE-BAR BEARINGS (ONE PIECE)
14-CONNECTING LINK BEARINGS (ONE PIECE)
15-KEY LEVER BEARINGS (ONE PIECE)

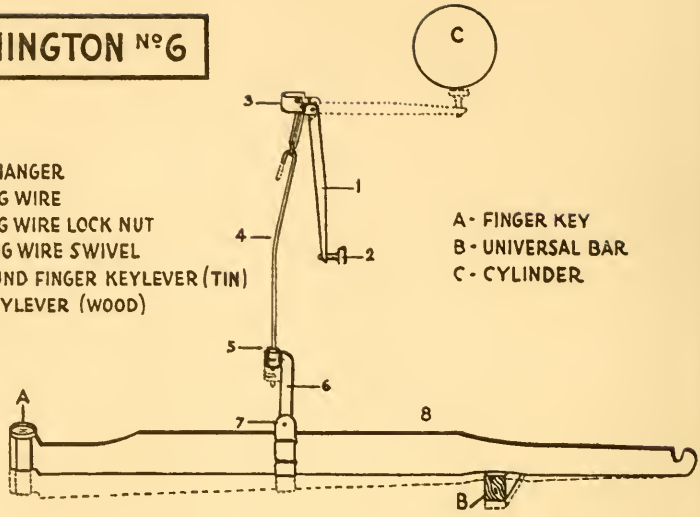


UNDERWOOD TYPE-BAR SECTION
SHOWING ACCELERATED ACTION

REMINGTON Nº6

1-TYPE-BAR
2-TYPE
3-TYPE-BAR HANGER
4-CONNECTING WIRE
5-CONNECTING WIRE LOCK NUT
6-CONNECTING WIRE SWIVEL
7-LOOP AROUND FINGER KEYLEVER (TIN)
8-FINGER KEYLEVER (WOOD)

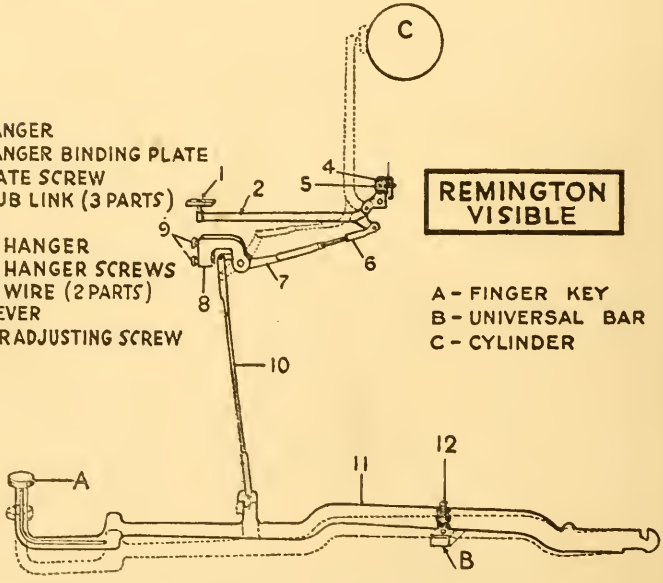
A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER



REMINGTON VISIBLE

1-TYPE
2-TYPE-BAR
3-TYPE-BAR HANGER
4-TYPE-BAR HANGER BINDING PLATE
5-BINDING PLATE SCREW
6-TYPE-BAR SUB LINK (3 PARTS)
7-BELL CRANK
8-BELL CRANK HANGER
9-BELL CRANK HANGER SCREWS
10-CONNECTING WIRE (2 PARTS)
11-FINGER KEY LEVER
12-UNIVERSAL BAR ADJUSTING SCREW

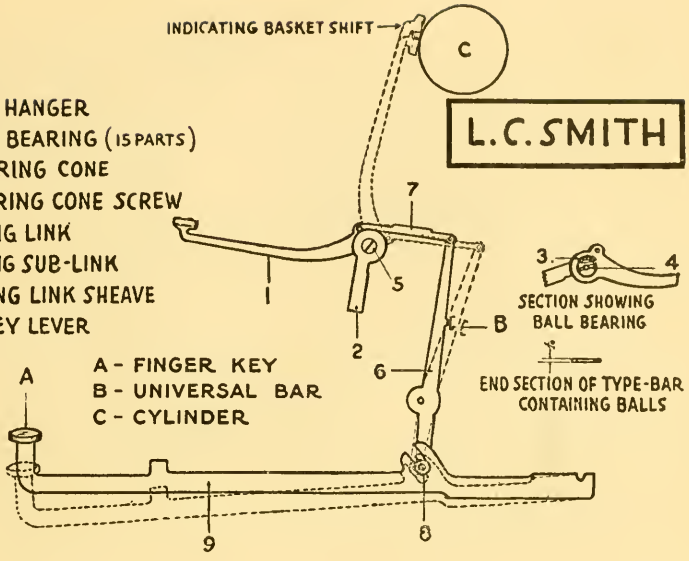
A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER



SHOWING CHANGE IN CONSTRUCTION NECESSARY IN THE TRANSFORMATION FROM THE BLIND TO THE VISIBLE WRITER.

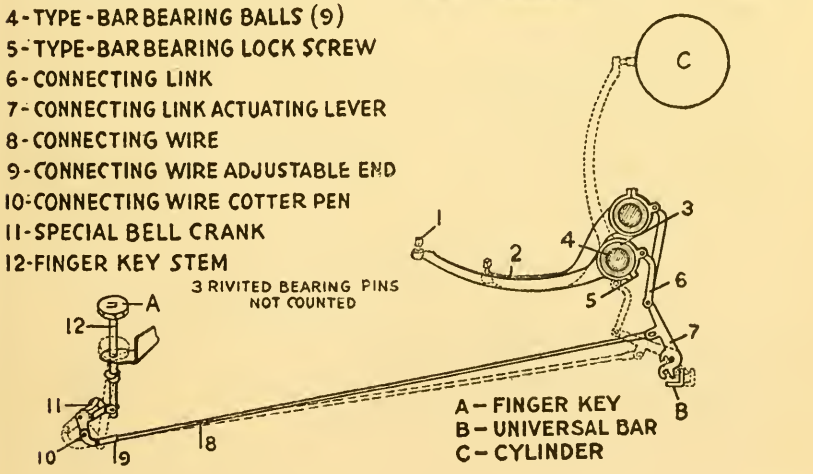
L.C. SMITH

1 TYPE-BAR
2 TYPE-BAR HANGER
3 TYPE-BAR BEARING (15 PARTS)
4 BALL BEARING CONE
5 BALL BEARING CONE SCREW
6 CONNECTING LINK
7 CONNECTING SUB-LINK
8 CONNECTING LINK SHEAVE
9 FINGER KEY LEVER



No 10 SMITH PREMIER VISIBLE

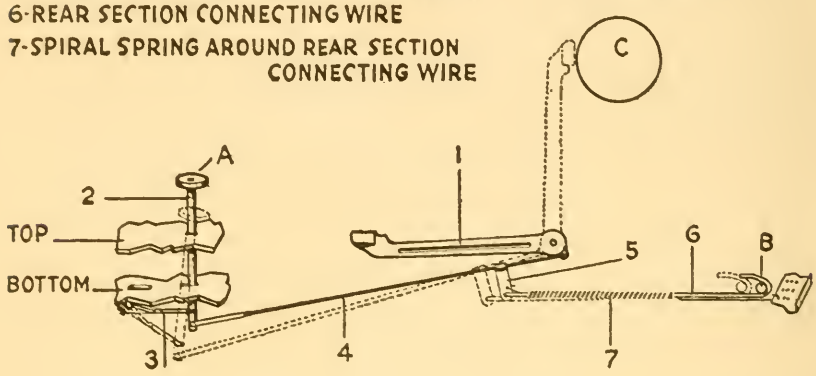
1 - TYPE
2 - TYPE-BAR
3 - TYPE-BAR BEARING CONE (2)
4 - TYPE-BAR BEARING BALLS (9)
5 - TYPE-BAR BEARING LOCK SCREW
6 - CONNECTING LINK
7 - CONNECTING LINK ACTUATING LEVER
8 - CONNECTING WIRE
9 - CONNECTING WIRE ADJUSTABLE END
10 - CONNECTING WIRE COTTER PEN
11 - SPECIAL BELL CRANK
12 - FINGER KEY STEM



ROYAL STANDARD

1-TYPE-BAR
2-FINGER KEY STEM
3-FRONT SECTION CONNECTING WIRE
4-MIDDLE SECTION CONNECTING WIRE
5-INTERMEDIATE ARM CONNECTING WIRE
6-REAR SECTION CONNECTING WIRE
7-SPIRAL SPRING AROUND REAR SECTION CONNECTING WIRE

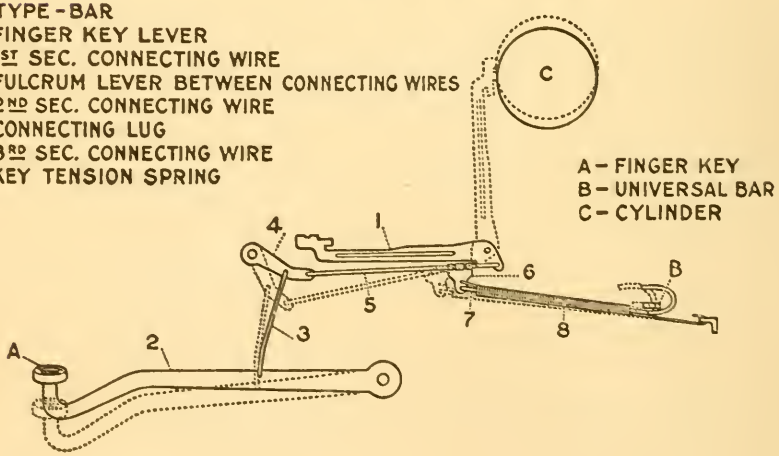
A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



Nº 10 ROYAL

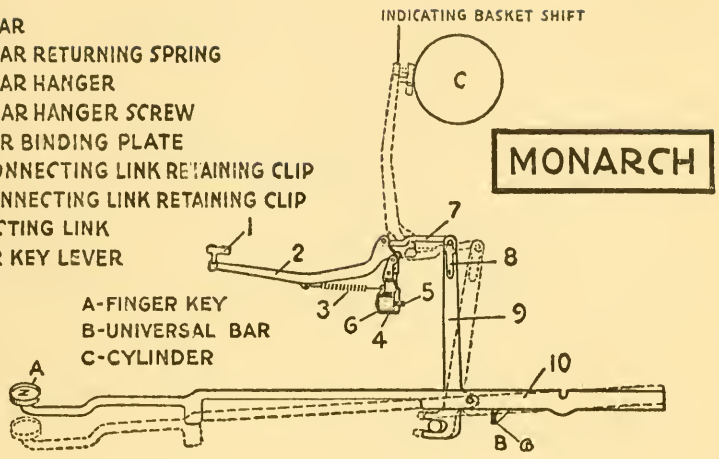
1-TYPE-BAR
2-FINGER KEY LEVER
3-1ST SEC. CONNECTING WIRE
4-FULCRUM LEVER BETWEEN CONNECTING WIRES
5-2ND SEC. CONNECTING WIRE
6-CONNECTING LUG
7-3RD SEC. CONNECTING WIRE
8-KEY TENSION SPRING

A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



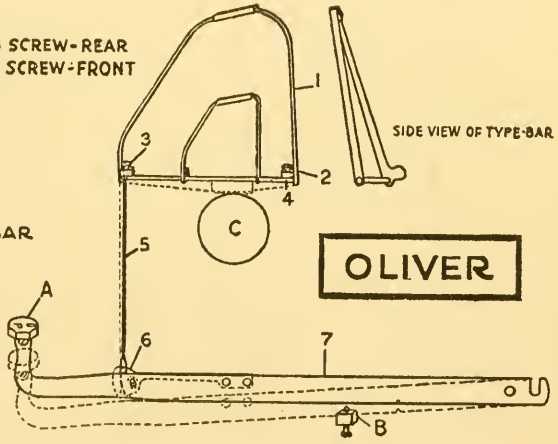
1-TYPE
2-TYPE-BAR
3-TYPE-BAR RETURNING SPRING
4-TYPE-BAR HANGER
5-TYPE-BAR HANGER SCREW
6-HANGER BINDING PLATE
7-SUB CONNECTING LINK RETAINING CLIP
8-SUB CONNECTING LINK RETAINING CLIP
9-CONNECTING LINK
10-FINGER KEY LEVER

A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



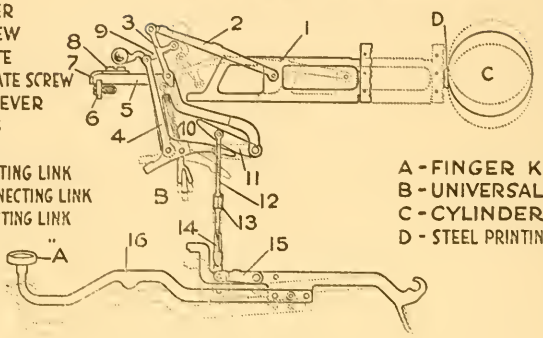
1 - TYPE-BAR
2 - TYPE-BAR FASTENING SCREW-REAR
3 - TYPE-BAR FASTENING SCREW-FRONT
4 - TYPE-BAR BEARING
5 - CONNECTING LINK
6 - SHOCK ABSORBER
7 - FINGER KEY LEVER

A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER



NOISELESS

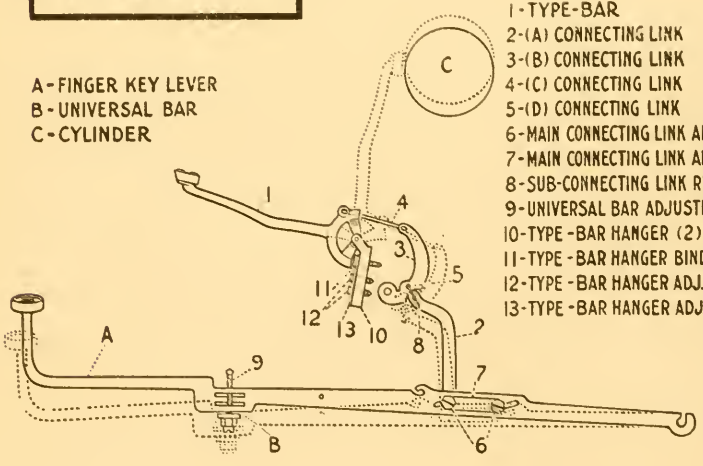
1-TYPE-BAR
2-TYPE-BAR DRIVING ARM
3-TYPE-BAR DRIVING ARM LEVER
4-BELL CRANK
5-BELL CRANK HANGER
6-B — ADJUSTING SCREW
7-E L — RETAINING PLATE
8-L — RETAINING PLATE SCREW
9-C R — INTERM. LEVER
10-A N — SPRING
11-K — CAM
12-UPPER SECTION CONNECTING LINK
13-ADJUSTING SECTION CONNECTING LINK
14-LOWER SECTION CONNECTING LINK
15-RETAINING PLATE " "
16 FINGER KEY LEVER (2)
16 RIVETS AND
13 FRICTIONAL POINTS



A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER
D-STEEL PRINTING BAR

VICTOR

A-FINGER KEY LEVER
B-UNIVERSAL BAR
C-CYLINDER

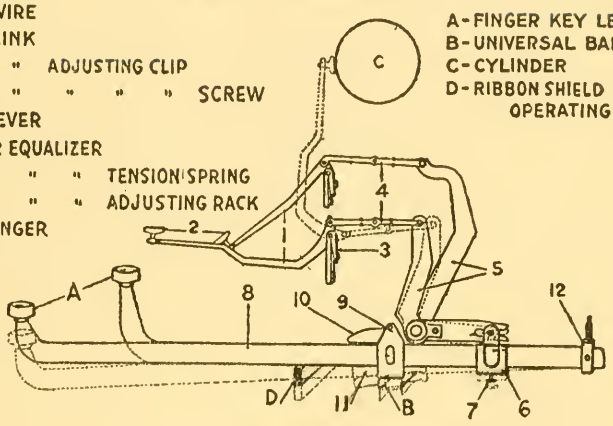


1-TYPE-BAR
2-(A) CONNECTING LINK
3-(B) CONNECTING LINK
4-(C) CONNECTING LINK
5-(D) CONNECTING LINK
6-MAIN CONNECTING LINK ADJ. SCREW (2)
7-MAIN CONNECTING LINK ADJ. SCREW PLATE
8-SUB-CONNECTING LINK RETAINING WIRE
9-UNIVERSAL BAR ADJUSTING SCREW
10-TYPE-BAR HANGER (2)
11-TYPE-BAR HANGER BINDING SCREW
12-TYPE-BAR HANGER ADJ. SCREWS (2)
13-TYPE-BAR HANGER ADJ. SCREW PLATE

FOX VISIBLE

1-TYPE-BAR
2-TYPE
3-TYPE BAR HANGER
4-CONNECTING WIRE
5- " " " " LINK
6- " " " " " ADJUSTING CLIP
7- " " " " " " " " SCREW
8-FINGER KEY LEVER
9-UNIVERSAL BAR EQUALIZER
10- " " " " " TENSION SPRING
11- " " " " " ADJUSTING RACK
12-KEY LEVER HANGER

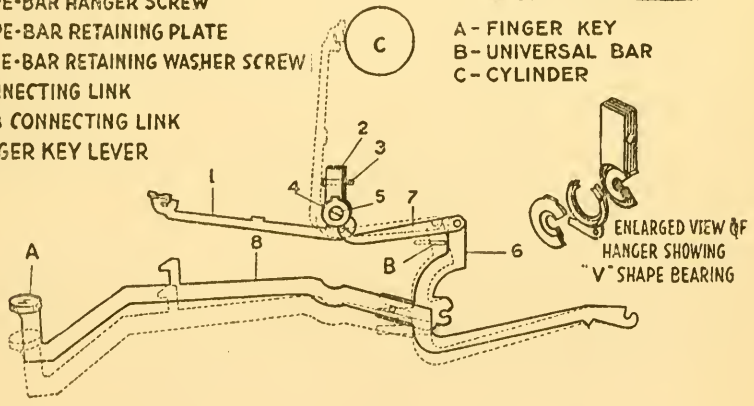
A-FINGER KEY LEVER
B-UNIVERSAL BAR
C-CYLINDER
D-RIBBON SHIELD OPERATING BAR



STEARNS

1 TYPE-BAR
2 TYPE-BAR HANGER (4 PARTS)
3 TYPE-BAR HANGER SCREW
4 TYPE-BAR RETAINING PLATE
5 TYPE-BAR RETAINING WASHER SCREW
6 CONNECTING LINK
7 SUB CONNECTING LINK
8 FINGER KEY LEVER

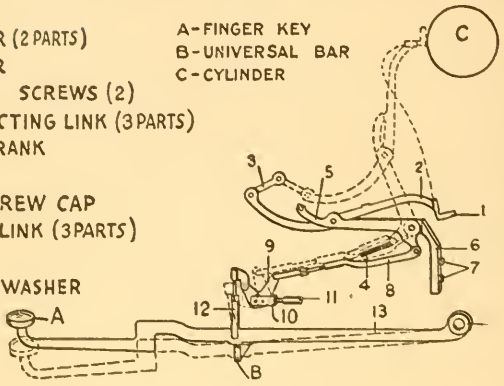
A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



YOST MODEL "A" VISIBLE

1-TYPE
2-TYPE-BAR
3- " " ANCHOR LINK
4- " " RETURN SPRING
5- " " ACTUATING LEVER (2 PARTS)
6-ACTUATING LEVER HANGER
7- " " " " SCREWS (2)
8- " " " CONNECTING LINK (3 PARTS)
9-CONNECTING LINK BELL CRANK
10-BELL CRANK HANGER
11- " " " SCREW CAP
12-KEY LEVER CONNECTING LINK (3 PARTS)
13-KEY LEVER
14- " " SEPARATING WASHER

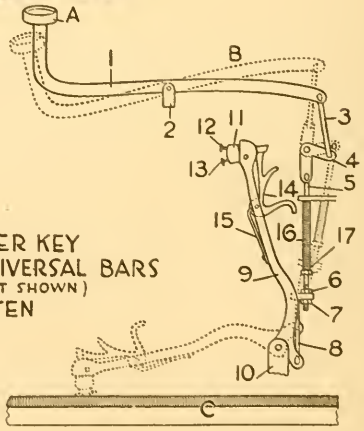
A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER



ELLIOTT-FISHER

1-FINGER KEY LEVER
2- " " " FULCRUM
3-UPPER CONNECTING LINK
4-BELL CRANK
5-INTERMEDIATE CONNECTING LINK
6-LOCK NUT
7- " "
8-LOWER CONNECTING LINK
9-TYPE-BAR
10- " " FULCRUM
11-TYPEBLOCK
12-TYPE (UPPER CASE)
13- " (LOWER CASE)
14-UPPER CASE SHIFT LOCK
15-SHIFT LOCK TENSION SPRING
16-TYPE-BAR TENSION SPRING
17-TENSION SPRING COLLAR
9 FULCRUMS

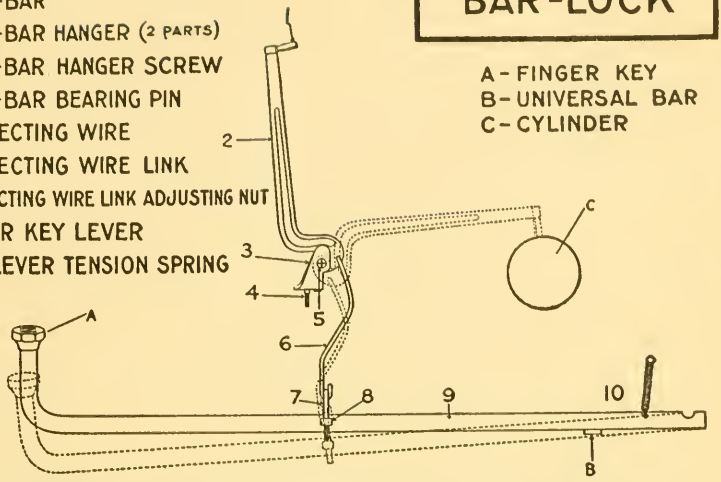
A-FINGER KEY
B-3 UNIVERSAL BARS
(NOT SHOWN)
C-PLATEN



1 TYPE
2 TYPE-BAR
3 TYPE-BAR HANGER (2 PARTS)
4 TYPE-BAR HANGER SCREW
5 TYPE-BAR BEARING PIN
6 CONNECTING WIRE
7 CONNECTING WIRE LINK
8 CONNECTING WIRE LINK ADJUSTING NUT
9 FINGER KEY LEVER
10 KEY LEVER TENSION SPRING

BAR-LOCK

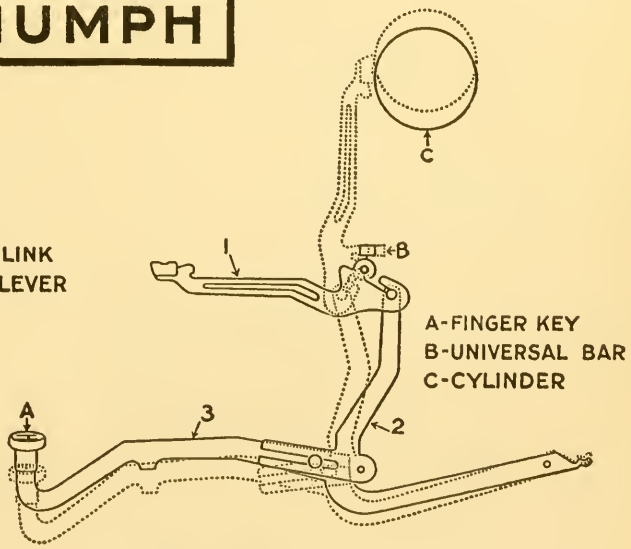
A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER



TYPEBARS OF FOREIGN TYPEWRITERS, PAGES 115, 116, 117.

TRIUMPH

1 - TYPE-BAR
2 - CONNECTING LINK
3 - FINGER KEY LEVER

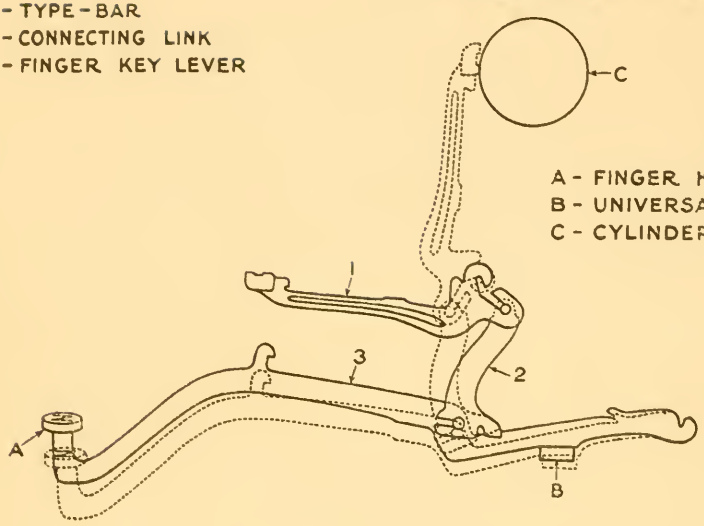


A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER

MADE IN GERMANY.

CONTINENTAL

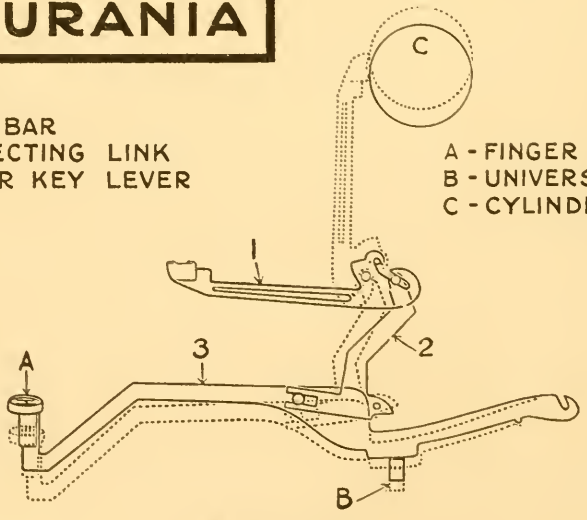
1 - TYPE - BAR
2 - CONNECTING LINK
3 - FINGER KEY LEVER



MADE IN GERMANY.

URANIA

1 - TYPE - BAR
2 - CONNECTING LINK
3 - FINGER KEY LEVER

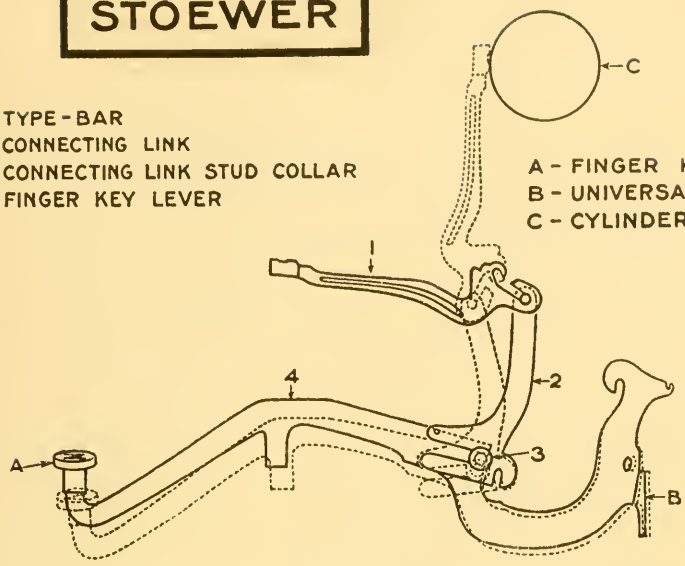


MADE IN GERMANY.

STOEWER

1 - TYPE-BAR
2 - CONNECTING LINK
3 - CONNECTING LINK STUD COLLAR
4 - FINGER KEY LEVER

A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER

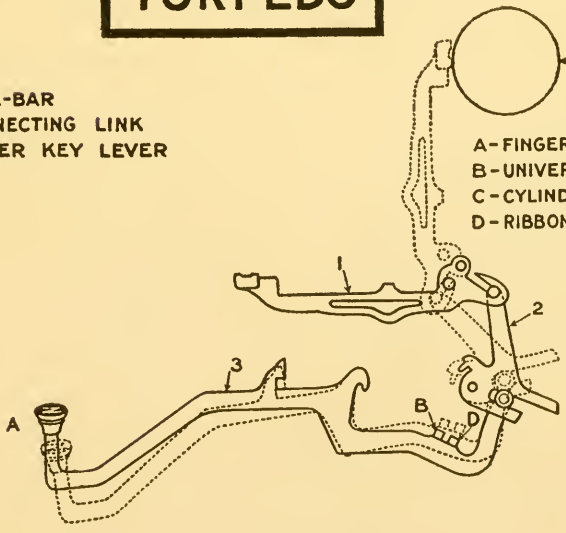


MADE IN GERMANY.

TORPEDO

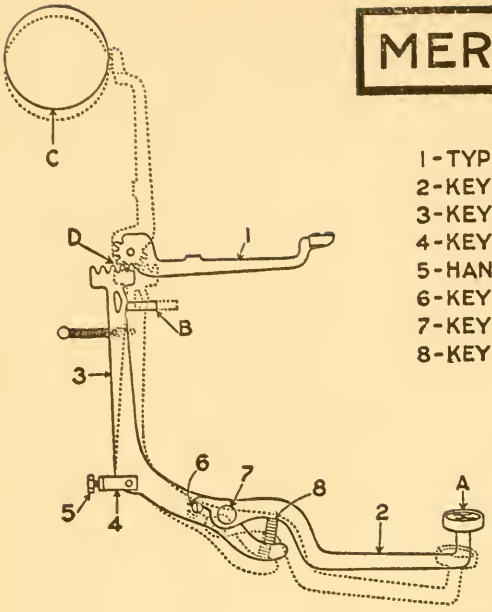
1 - TYPE-BAR
2 - CONNECTING LINK
3 - FINGER KEY LEVER

A - FINGER KEY
B - UNIVERSAL BAR
C - CYLINDER
D - RIBBON UNIVERSAL BAR



MADE IN GERMANY.

MERCEDES



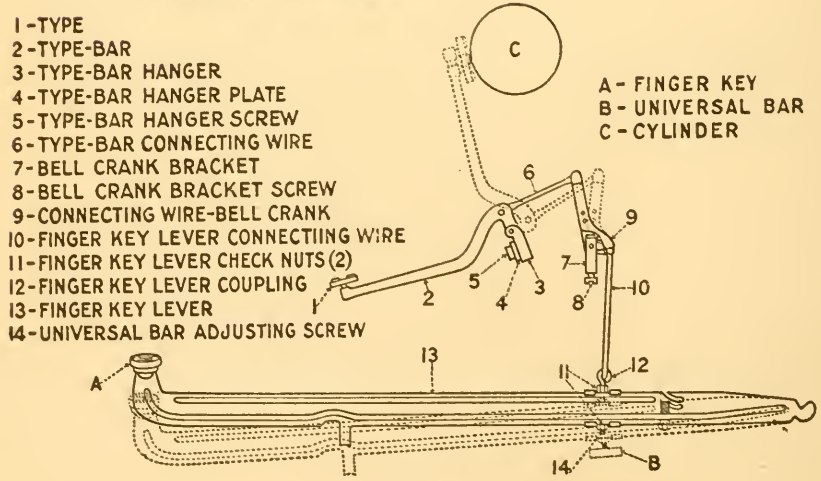
1-TYPE-BAR.
2-KEY LEVER PART "A".
3-KEY LEVER PART "B".
4-KEY LEVER FULCRUM HANGER.
5-HANGER BINDING NUT.
6-KEY LEVER "A" STOP SCREW (2).
7-KEY LEVER "A" FULCRUM.
8-KEY LEVER "A" SPRING.

A-FINGER KEY LEVER.
B-UNIVERSAL BAR.
C-CYLINDER.
D-TYPE-BAR GEAR ACTION

MADE IN GERMANY.

JAPY

1-TYPE
2-TYPE-BAR
3-TYPE-BAR HANGER
4-TYPE-BAR HANGER PLATE
5-TYPE-BAR HANGER SCREW
6-TYPE-BAR CONNECTING WIRE
7-BELL CRANK BRACKET
8-BELL CRANK BRACKET SCREW
9-CONNECTING WIRE-BELL CRANK
10-FINGER KEY LEVER CONNECTIING WIRE
11-FINGER KEY LEVER CHECK NUTS (2)
12-FINGER KEY LEVER COUPLING
13-FINGER KEY LEVER
14-UNIVERSAL BAR ADJUSTING SCREW



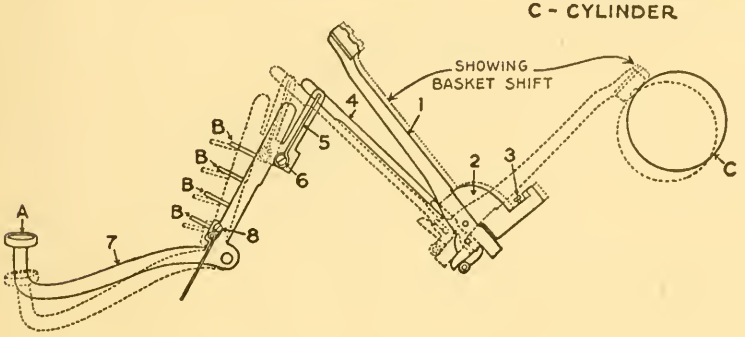
A-FINGER KEY
B-UNIVERSAL BAR
C-CYLINDER

MADE IN GERMANY.

1 - TYPE-BAR
2 - TYPE-BAR HANGER
3 - TYPE-BAR HANGER SCREW
4 - CONNECTING LINK
5 - CONNECTING LINK WIRE
6 - CONNECTING LINK WIRE SCREW
7 - FINGER KEY LEVER
8 - KEY LEVER SPRING RETAINING SCREW

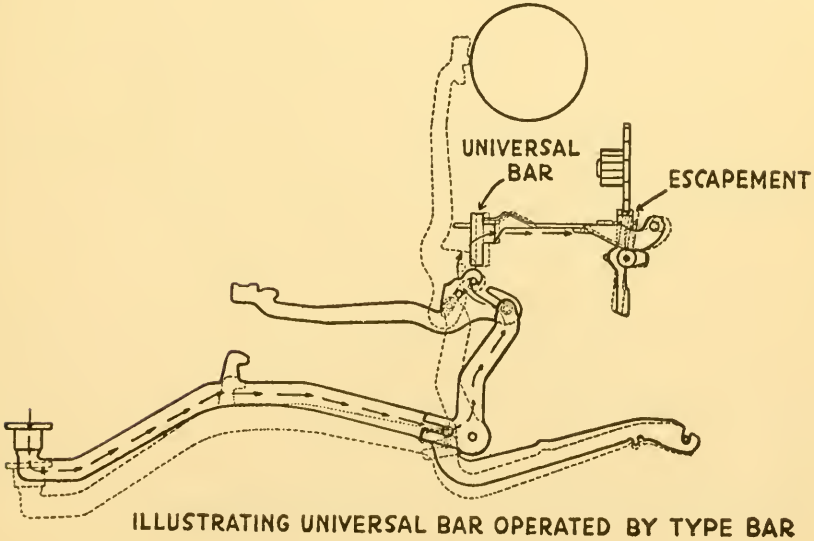
IDEAL

A - FINGER KEY
B - UNIVERSAL BARS (4)
C - CYLINDER



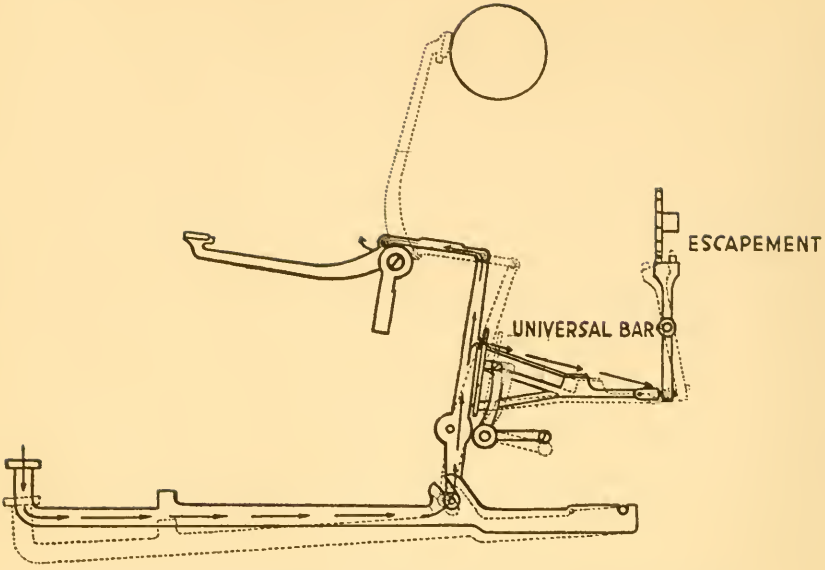
MADE IN GERMANY.

ESCAPEMENTS

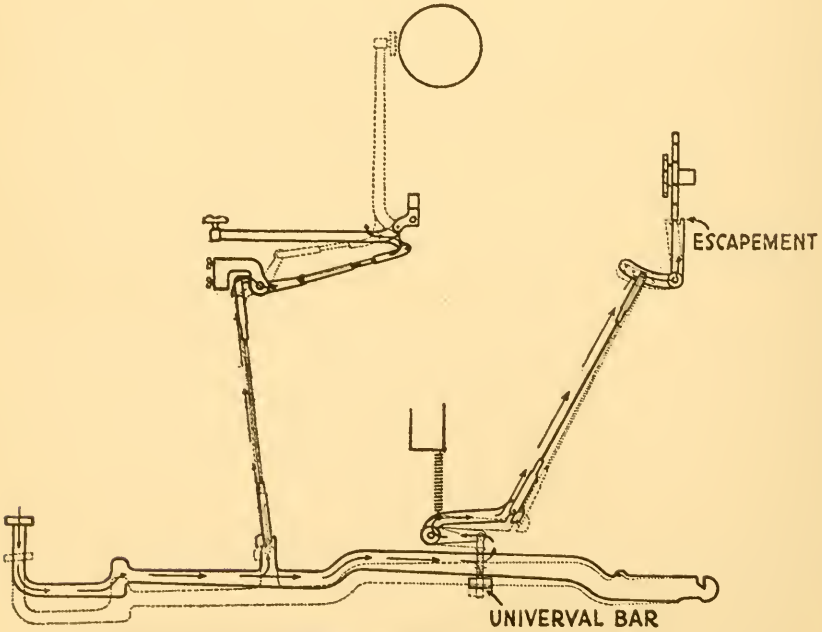


ILLUSTRATING UNIVERSAL BAR OPERATED BY TYPE BAR

FOLLOW THE ARROWS.



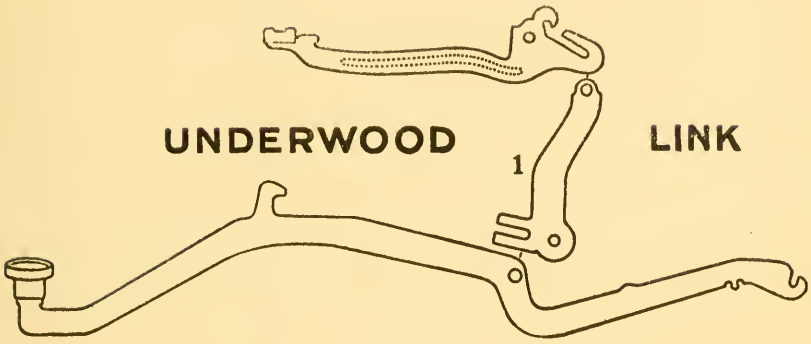
ILLUSTRATING UNIVERSAL BAR OPERATED BY CONNECTING LINK

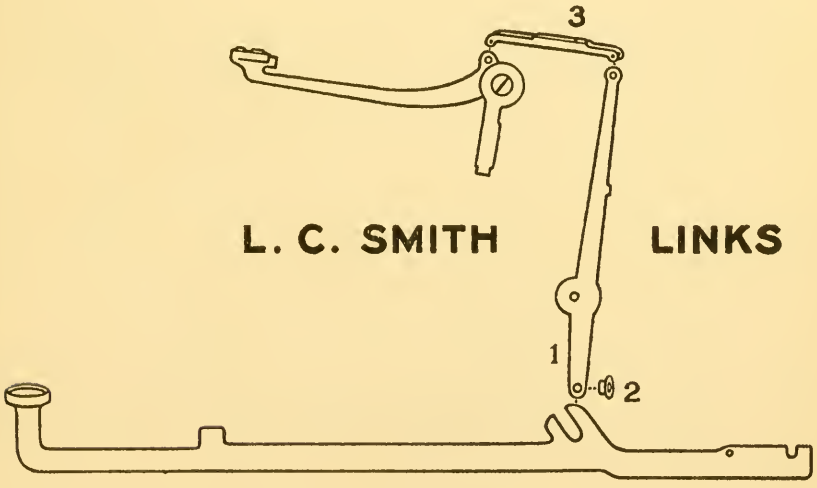


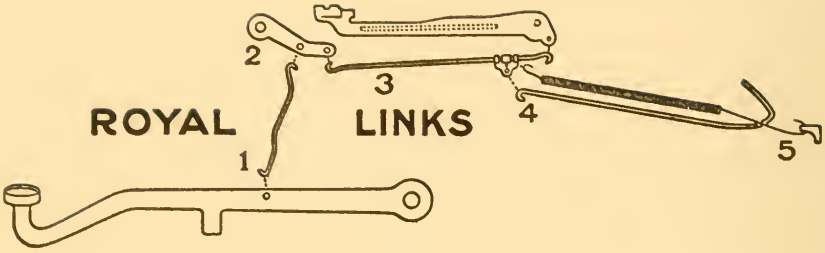
ILLUSTRATING UNIVERSAL BAR OPERATED BY FINGER KEY LEVER

LINKS

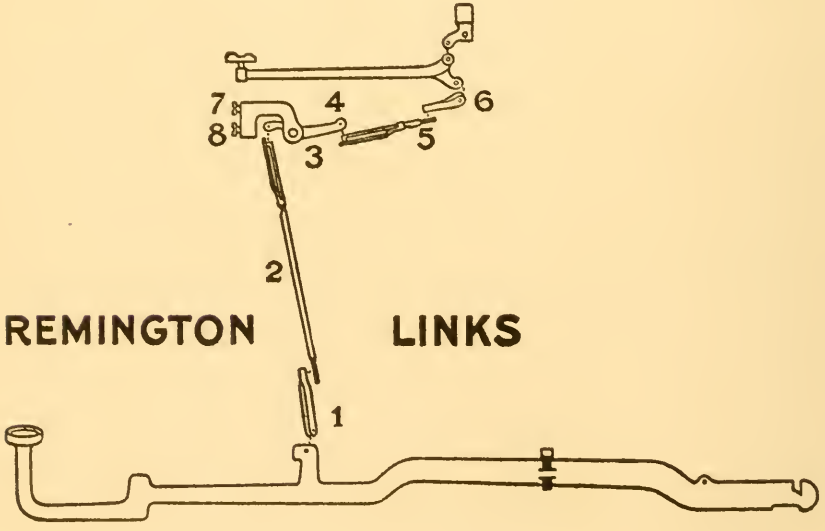
"A CHAIN IS NO STRONGER THAN ITS WEAKEST LINK."





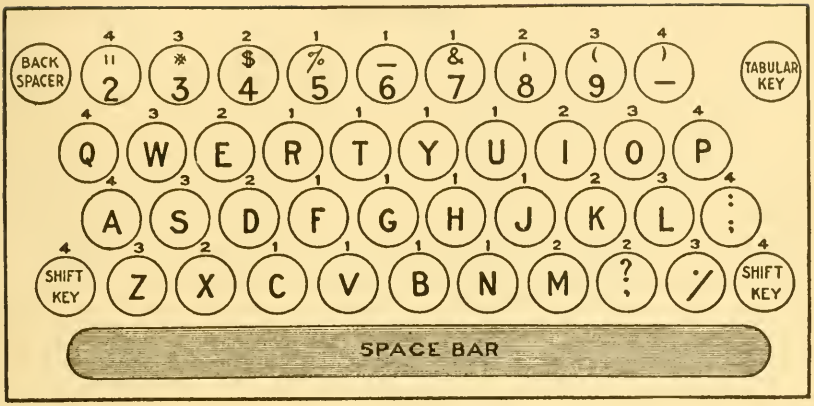


ROYAL LINKS

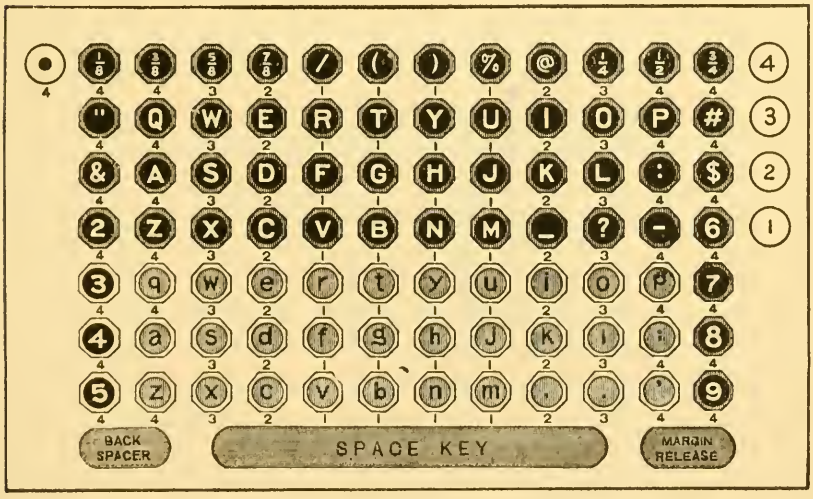


REMINGTON LINKS

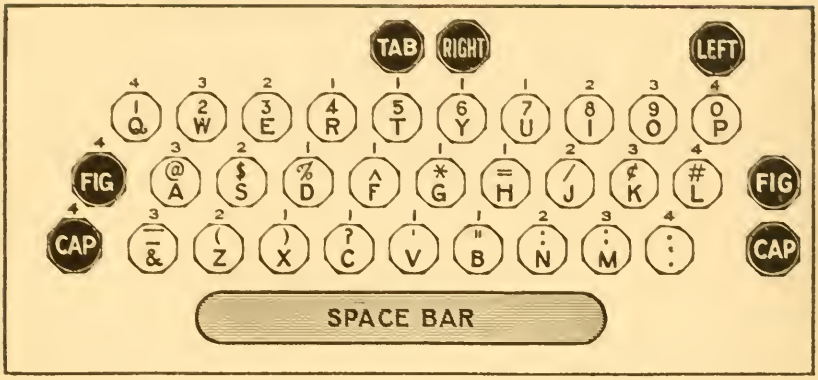
KEYBOARDS



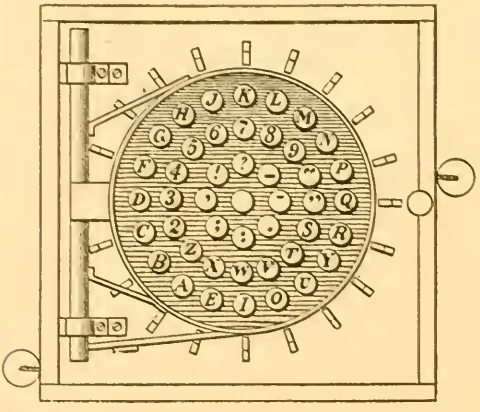
UNIVERSAL KEYBOARD.
SINGLE SHIFT KEY ON EACH SIDE.



DOUBLE OR "DUPLICATE" KEYBOARD.
A KEY FOR EACH CHARACTER.



DOUBLE SHIFT KEYBOARD.
THREE CHARACTERS ON EACH KEY.



ALLEN KEYBOARD.
ILLUSTRATING ONE OF MANY SUGGESTIONS CONCERNING THE ARRANGEMENT OF A KEYBOARD.

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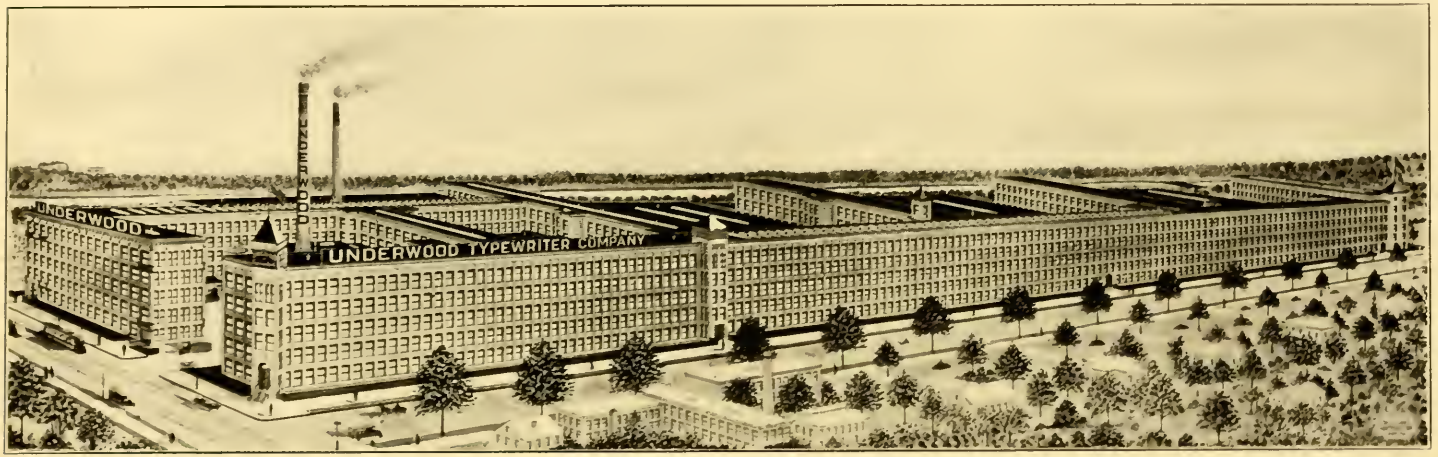
ILLUSTRATIONS



UNDERWOOD FACTORY, HARTFORD, CONN.

THE LARGEST TYPEWRITER PLANT IN THE WORLD