

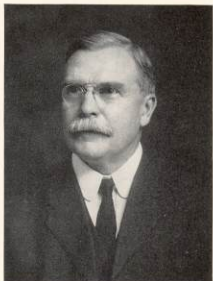
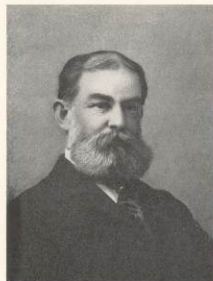
Origin and Development of the Linotype Machine

PART I.—BY HENRY LEWIS BULLEN



AMONG inventions none has a history more curious than that of the linotype machine. When the machine first became commercially practicable in 1891 it was a combination of the inventiveness of several minds, among which that of Mergenthaler was by no means the most effective. In this review an attempt is made to award the credit due to each of the various men who were concerned, consciously or unconsciously, in this important invention, and thereby

after Sholes had successfully passed it through the experimental stages. On Densmore's first visit to Clephane, the latter undertook to test every machine Sholes might make, and agreed to pay \$150 for each machine delivered. These experimental machines were made by hand. There were six of them constructed at different periods, and put to use in his business by Clephane, but, while each was an improvement on its predecessor, all revealed serious defects. Sholes came to think Clephane was too exacting, while Densmore persisted in the belief that to satisfy Clephane was to satisfy the world. So



The Men Who Made the Mergenthaler Linotype Machine Possible

James Ogilvie Clephane, a lawyer who carried on the business of law reporting. To him primarily the world owes the linotype machine. He was born in Washington, D. C., February 21, 1842. Ottomar Mergenthaler, born in a village in Wurttemberg, Germany, May 10, 1854. He was a watchmaker, learning his trade in Biebrichem, Wurttemberg. In 1872 he came to America, and entered the employ of his uncle, A. Hahl, who then had a machine shop in Washington, which he later on removed to Baltimore. Linn Boyd Benton is the present director of the general manufacturing department of the American Type Founders Company. He was born in Little Falls, New York, May 13, 1844. He is now in his eightieth year, but still active. Originally a printer, his experience in typesetting began in 1873, since which time he has revolutionized the art of punch and matrix making. No portrait of J. W. Shuckers is available to us.

broaden the field for historians who may hereafter venture upon more detailed narratives of the various steps of this great event in the history of printing.

The world owes the linotype machine primarily to the progressiveness and persistence of James Ogilvie Clephane, a court stenographer and later a practicing lawyer in Washington, D. C., in which city he was born on February 21, 1842. Oppressed by the tediousness of producing manuscript copies of the notes of himself and his employees for the law courts and the printers, Clephane became interested as early as 1866 in an invention of a typewriting machine, which proved to be impracticable. However, his interest in mechanical writing induced a visit to him in 1867 by James Densmore, the partner of Christopher Latham Sholes, inventor of the first practicable typewriter, which was launched to fame and fortune in 1873 as the Remington typewriter, in which year its manufacture was begun by E. Remington & Sons at Ilion, New York,



Philip Tell Dodge, who became president and general manager of the Mergenthaler Linotype Company in 1891, and is still president. His son, Norman Dodge, is now general manager, having succeeded his father. The elder Dodge was born in Fond du Lac, Wisconsin, July, 1851. He is a graduate of George Washington University. By profession he was a patent attorney, in which capacity he became interested in Mergenthaler's invention. He is also president of the International Paper Company.

it proved to be, and in 1872 nothing remained to Sholes and Densmore but to find a manufacturer who would finance the machine as well as make it. When the Remingtons undertook the manufacture, the first seven Remingtons were sold to and used by Clephane. How few inventors have been fortunate enough to find a business man who would try out their inventions and pay for the machines subjected to the trials! Yet this spirit of invincible coöperation, which had prevented a crisis in the affairs of the inventor of the typewriter, was to be more amazingly displayed in connection with the invention of the Mergenthaler Linotype Machine. Clephane was offered by Densmore a large share of his interest in the Sholes' invention for a comparatively small sum, before it passed into the hands of the Remingtons. But Clephane was not a capitalist, his income being derived solely from his law reporting business, and he was compelled to decline the offer. Densmore, needing money, disposed of the larger part of his

interest to other persons, yet from the small interest he was able to retain he eventually received in dividends as much as \$150,000 a year, while from the same amount of stock his family now enjoys a much larger income.

Clephane's objective from the beginning was to produce a machine which would mechanically produce copy that would

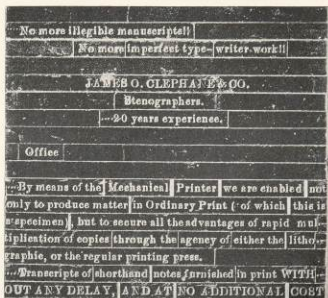


eliminate the cost of type composition. He first tried to interest Phelps, the inventor of the telegraph printing machine, but Phelps declined the attempt. Charles T. Moore, an inventor of a telegraph printing machine never put to use, persuaded Clephane that he could invent the machine he was in quest of. The idea was to print law reports by means of a keyboard on lithographic transfer paper in long, narrow strips, using characters similar to printers' types, and then transfer the original to lithographic stones for printing as many copies as might be desired. The printing characters were engraved on wheels, one for roman, another for italic. The first of these machines was built for Clephane by A. Hahl & Co., of Baltimore, while another machine, also designed by Moore, for arranging the printed strips into lines and pages, was completed by a machinist named Malby in Washington. This was in 1877, at which time a company had been organized to handle the process and machines—the National Machine Printing Company, capital \$28,000. Under experimental conditions the printing was satisfactory. In forming lines and pages of the required measures from the long, narrow printed strips, justification was effected crudely and unevenly in the manner illustrated in Fig. 2. It was when the transfer to stone was attempted that the invention proved to be unreliable. The stone could not be depended upon to take the transfer complete, or to reproduce it clearly when it did "take." In the building of this machine Clephane first came into contact with Ottmar Mergenthaler, who was then a foreman in the machine shop of his uncle, A. Hahl. Also in this adventure Clephane and Moore first learned of the difficulties in the way of justifying lines to regular widths. Two printing machines were made. Both were sold to a New York company formed to operate them under license, and a not inconsiderable amount of printing was done on them, but none of it profitably.

But it appears that while working on his invention of the lithographic transfer process, described above, Moore evolved the idea of a stereotypic process, and succeeded in casting in a mold a type-high "slug," with printable type on its surface, the forerunner, in fact, of the present lino-type slug. Moore, supported in his experiments by Clephane, patented his "slug" idea, and the Mergenthaler Lino-type Company eventually became owner of that patent. Convinced that the stereotypic process was superior to the lithographic process he was using,

Clephane arranged with A. Hahl & Co. to build an apparatus for making the matrices, the result being the Rotary Impression Machine, patented in 1879, a later and improved variation of which is shown in Fig. 1 and described thereunder. A patent was granted to Mergenthaler for this machine, his first invention, which was, however, the property of Clephane. A page of matrices for the stereotypic process is shown in Fig. 2. Such a page was cast in a peculiar kind of mold, having a series of brass bars which separated the lines, so that though several lines were cast at one pouring of metal, each line left the mold a separate slug. This stereotypic process superseded the lithographic process. Mergenthaler's connection with it ceased in 1879. It was improved at various times by other machinists. However, this first Mergenthaler patent afforded him a basis for becoming financially interested in the National Machine Printing Company. He and Hahl were each given three shares of the par value of \$1,000 apiece, shortly after which the owners of the invention established a machine shop of their own in Washington, and Mergenthaler's connection with the evolution of the lino-type machine ceased, not to be resumed until about four years later, in 1883. Mergenthaler thought so little of the future of the company that in 1881 he sold his three shares for \$60. Hahl, holding on a year or two longer, sold his three shares for \$900. These shares today represent a value of tens of thousands of dollars.

In 1882 Clephane persuaded L. G. Hine, a wealthy lawyer of Washington, to acquire a controlling interest in the National Machine Printing Company, which was still hopeful of its stereotypic process. A new company, the National Typo-



graphic Company, was formed, with a capital of \$1,000,000, which acquired all the interests and patents of its predecessors in the quest of a workable machine to eliminate hand composition. Activities in producing machines and apparatus for the stereotypic process were increased, without profit, but probably without loss. Meanwhile, Mergenthaler, who had gone into the machinist business on his own account on January 1, 1883, had been studying Clephane's objective. Out of his studies he evolved his first so-called "band" machine.

It was intended to produce papier maché matrices in single lines to any required measure, the matrices to be assembled as theretofore, as shown in Fig. 2. The radical new features were the abandonment of



FIG. 3.—Mergenthaler's second "band" machine of 1884, on which the first line-of-type was cast, and in which a casting apparatus was first used, reproduced from a photograph of an incomplete and damaged machine, the last survivor. See description under Fig. 4.

the substitution of bands or bars of metal, upon the edges of which were engraved in relief in steel all the letters and other characters used in ordinary type composition. At the touch of the corresponding key on the keyboard the bar dropped until the required letter came into alignment with other letters, which formed words and lines. The line of punches was then pressed into a long strip of papier maché, which in turn was assembled on paper and justified as in Fig. 2, after which each page was stereotyped in a hand mold.

During the development of Mergenthaler's first band machine, the means of improving it dawned on the inventor and his associates. One thought was: If a line of punches can be assembled and justified, why not a line of matrices? Another

thought was: If a line of metal matrices can be assembled, justified and controlled, why not make the cast direct from them? With these two thoughts the line-of-type machine was born! I am informed by a friend of Mergenthaler, who worked with him in developing the linotype machine, that it was Hine who suggested that the slugs might be cast in the same machine that aligned the band matrices, after he had been given the opportunity of seeing the process of typesetting in the typefoundry of John Ryan in Baltimore. The first casting apparatus applied in a linotype machine was a part of a hand typesetting machine bought from John Ryan. Mergenthaler is reported by his biographer, Schoenrich, whose biography was revised by the inventor and is in fact an autobiography, to have conceived the idea of "stamping matrices into his type bars and casting type metal into them in the same machine," while on a journey to Washington for the purpose of confessing the commercial impracticability of his first band or type bar machine, well as it worked in the machine shop. The National Typographic Company lost no time in ordering two of the band or type bar machines with band matrices and with a typefounder's casting apparatus attached.

It was in July, 1884, that the first line of type was cast in Mergenthaler's shop in Baltimore on Bank Lane on the "band" machine shown in Fig. 3. Hine and Clephane and their associates believed that they now had a practicable machine. A factory was set up in Baltimore, under the management of Mergenthaler, and preparations were made to begin manufacturing and selling. In this first linotype machine the most radical improvement was the introduction of a wedge justifier. In the first "band" machine Mergenthaler was still justifying in the crude way devised by Moore. In this second "band" machine the letter bands were justified by wedges placed between the words and spreading the lines to equal measures; but the wedge was not Mergenthaler's invention. The patent covering the first wedge justifier was bought by the National Typographic Company from Merritt Gally, well known to

printers as the inventor of the Universal Press, of which the Colt's Armory Press is now the most popular variation. Gally is also the original inventor of the player piano, player organ, and other remarkable and useful inventions. It was in 1872 that Gally was granted a patent for a machine to punch letters into papier maché, from which to make lines of matrices, in which justification of the letters was effected by wedges. Clephane and Hine and their associates believed they had reached their goal with this first line-of-type machine. A public exhibition was given in Washington in February, 1885, attended by President Arthur and many other celebrities. The affair ended with a banquet at which the guest of honor was Ottmar Mergenthaler. The banquet was presided over by Stillson Hutchins,

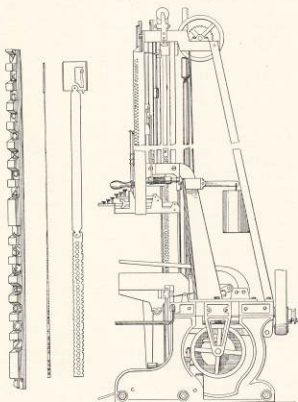


FIG. 4.—Detailed view of Mergenthaler's second "band" machine. At left, a magnified section of the "band" or bar, on one edge of which was punched matrices of all the characters of a font. Second to left, end view of a "band" drawn to same proportion as the machine itself. The bands were wedge shaped, the wedge being reversed on each alternate "band," so that under pressure from above the bands were wedged together tightly in the line of matrices. Third to left, side view of a "band" with notches in rear by which alignment was secured. By striking the corresponding key a band dropped until the desired letter matrix came into alignment with other letters in the line. There was a space key, but no automatic justification. Justification was effected by the operator extending the spacing by adding spacers until the line was full, consequently spacing was uneven. When the line of matrices was complete a mechanism carried it to the mold, where it was cast, after which each matrix band was lifted mechanically above the keyboard. As each "band" carried matrices for every character in the font, enough were required to fill a line as long as the mold would cast, which on this machine was twenty-three picas. In the third "band" machine a single justifying wedge was used for the first time, other details being as in the second or 1884 machine. These machines were complicated and expensive. None of them were put to practical use.

proprietor of the Washington Post, himself a stockholder in the National Typographic Company. To him belongs the honor of coining the all potent word, *Linotype*, now the property of the Mergenthaler Linotype Company. But, alas, the way of an invention is hard! The much-lauded machine was merely the promise of the actual linotype of commerce, which did not appear until six long and expensive years had elapsed.

(To be continued)

OBSERVE STATUS OF PRICE CUTTER

When you look around your community you will find that the most prosperous business houses are not those that cut prices, but those that maintain them and give value.—Exchange.

Origin and Development of the Linotype Machine

PART II.—BY HENRY LEWIS BULLEN



MERGENTHALER realized the impracticability of his perfected band machine earlier than his friendly and liberal backers, Clephane and Hine. The machine was much too expensive to build and the inventor could not get satisfactory alignment of his matrices. They were amazed at the confession of failure after so much splurge; but, courageous as ever, they resolved to defer manufacture and resume experiment. The new idea was the single-matrix machine—a reversion to the ancient method of the typesetters—harking back to first principles and practices, as also in the case of the casting apparatus and mold! But now more money was needed. Already the leading newspaper publishers were interested in the impracticable band machine. Under the advice of Stillson Hutchins (*Washington Post*), six other publishers, Whitelaw Reid (*New York Tribune*), W. N. Haldeman (*Louisville Courier-Journal*), Victor Lawson and Melville E. Stone (*Chicago Daily News*), Henry Smith (*Chicago Inter Ocean*), and W. H. Rand (Rand, McNally & Co., Chicago), formed a syndicate and set out to acquire all the available stock, at prices averaging about \$10 above par. The syndicate, however, was able to acquire only seven thousand out of forty thousand shares. But, as has been said, money was needed for further experiment. A pool was formed of all earlier interests and the new publishers' syndicate. For the control of the pool the syndicate paid, it is said, the sum of \$300,000. This arrangement was consummated early in 1885. Melville E. Stone succeeded Hine as president and general manager. His first act was to attempt the removal of the factory from Baltimore to Chicago, but Mergenthaler, who held a prominent position in the German social and associational circles of Baltimore, would not be moved. Stone was soon succeeded by Whitelaw Reid as president and general manager. Reid represented D. O. Mills, his father-in-law, a California millionaire, who invested largely in the Mergenthaler Printing Company.

In the summer of 1885 the first single-matrix machine was finished. It was a crude affair, but in it were the first of the invaluable single matrices now so familiar to every printer. Mergenthaler attacked the problem of assembling these matrices with little inventive genius. The 1885 machine is known as the first "blower" machine. The matrices were held in perpendicular channels, and, dropping straight down onto a wire rod in the horizontal assembling channel, were brought to the justifying point by means of blasts of air provided by a blower—a most unmechanical makeshift, which did not work satisfactorily. However, the directors of the company, nearly all of them newspaper proprietors hungering for economy in their composing rooms, thought the 1885 "blower" model was good enough. They ordered one hundred made, but Mergenthaler had the order reduced to one dozen. In July, 1886, the first of this dozen, much improved over the 1885 model, the first linotype machine ever put to practical use in a printing plant, was installed in a special room in the office of the *New York Tribune*. The 1886 model, shown in Fig. 5, was found to be practicable, it justified the expectations regarding its economy, but many difficulties presented themselves, which Mergenthaler was eager to overcome before beginning quantity production. He was ordered to cease experimenting and to make two hundred machines. Thirty of these were built by Mergenthaler, and one hundred and sixty in a new factory in Brooklyn. Deliveries did not begin until the summer of 1887. In February, 1888, about sixty machines were in use in the composing rooms of members of the syndicate. All were of

the 1886 model, but none of them were sufficiently satisfactory. The directors were not only impatient with the delays in manufacturing, but skeptical of ultimate success. While the second hundred machines were in progress, with forty of the first hundred unfinished, the directors ordered work suspended on a third lot of one hundred. As a consequence of various disagreements Mergenthaler severed his connection with the company in April, 1888, leaving with it an unsatisfactory machine, which he had been prohibited from improving. A factory was established in Brooklyn, and there the first two hundred machines were completed; nevertheless at the close of 1888 the prospects for the success of the Mergenthaler Printing Company were far from being favorable.

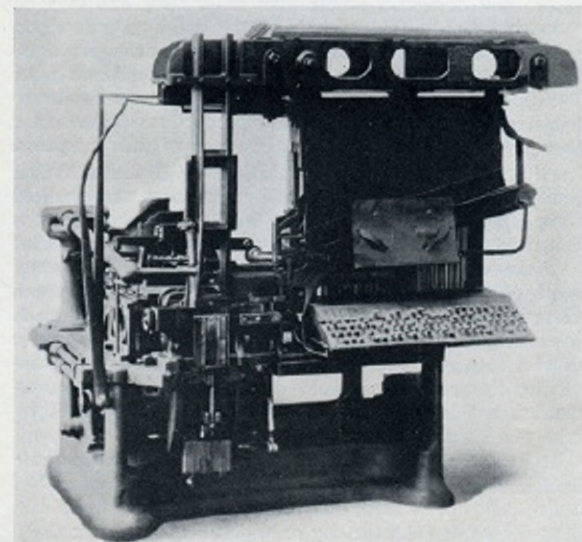


FIG. 5.—The Mergenthaler Linotype Machine of 1886, the second of the "blower" machines, so-called because the individual matrices were blown to the assembling point by a strong blast of air. The first "blower" machine was made in 1885. It was the first in which separate matrices for each character were used. In this picture the air pump is not shown. The matrix channels were perpendicular and in dropping into them the matrices were quickly damaged. Although very faulty, between 1886 and 1890 two hundred of these machines were made and distributed among the composing machines of the members of the syndicate of publishers, except sixty that were sold to a British syndicate. They cast excellent slugs. The "blower" machines were quickly scrapped when Mergenthaler's machine of the present model appeared in 1890.

Mergenthaler did not lose interest in his invention. He established a small work shop with money partially procured by selling his stock in the company that bore his name. Towards the end of 1888 he had completed drawings for an improved machine, virtually the machine of today, known as the 1890 model. He applied to James O. Clephane for financial assistance in building his improved machine. The Washington stockholders were now in opposition to the somewhat discouraged stockholders dominated by Mills. They provided Mergenthaler with funds to build his new machine. They were successful in regaining control of the Mergenthaler Printing Company, and L. G. Hine succeeded Reid as president and general manager. Reid in his last report confessed that the 1886 machine had developed so many defects that it seemed inadvisable to continue the manufacture. The Washington invincibles, led by Clephane and Hine, as usual, were in favor of persevering. When Hine became president, in January, 1889, there was not a single order on hand. The first two

hundred machines are said to have cost \$380,000 and were sold for \$160,000. In addition to the unsatisfactoriness of the 1886 machine, the directors were now confronted with a difficulty which in their own words was "seemingly insurmountable." Here was a machine; but no adequate means of supplying it with matrices had been devised. The rapid production of matrices required the rapid production of steel punches. The typefounder may use a steel punch only once;

he seldom would use it half a dozen times. But each linotype matrix requires the use of a punch, and punches are fragile things. A steel punch may break the first time it is used. Where steel punches are used thousands of times a day the percentage of breakages is serious. Steel punches also wear out and must be replaced immediately they show signs of wear. Steel punches cut by hand are very expensive. It is said that the hand-cut steel punches of the Mergenthaler Printing Company cost \$5 each. This cost, however, was a small matter compared with the slowness of production when cut by hand. In 1890 the linotype company had six or seven punch cutters in its employ, and these could do no more than keep up the supply of matrices for about two hundred machines. Not in all the world could enough steel punch cutters be found to furnish an adequate supply of matrices, without which the machines were as useless and unsalable as a gun where powder is unobtainable. Further, steel punch cutting is a most difficult act, few men having the temperament to succeed

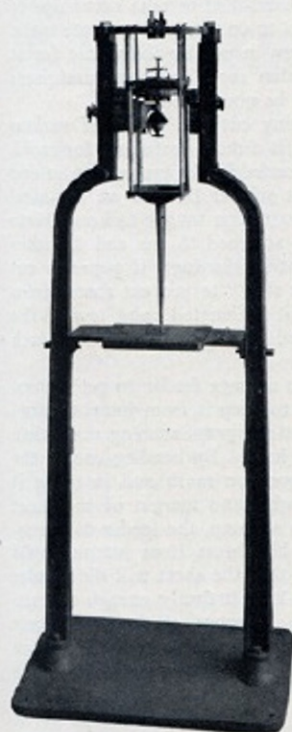


FIG. 6.—The Benton punch-cutting machine, on which the first steel punch was cut for the Mergenthaler linotype machine. The second machine built by Benton. The Mergenthaler Printing Company bought No. 3 in 1889 and several others shortly after. Without this invention Mergenthaler's invention was impracticable. This machine is in the Typographic Library and Museum of the American Type Founders Company, in Jersey City.

in it, while the process of instruction was slow and tedious. Another obstacle was found in the fact that the most expert punch cutters could not exactly duplicate any letter they might have cut. If the punch of a certain letter broke, the letter that replaced it was more or less a "wrong font." It was probably a realization of this "seemingly insurmountable obstacle" that induced the Mills interests to give way to the Clephane-Hine interests in the management. The Mills interests were seemingly saying good-by to their investment.

Now there was a man in Milwaukee who had been confronted with a similar problem, though on a smaller scale. He needed punch cutters and could not get them. Without them a valuable typemaking patent—self-spacing types—would run its course with limited profits for lack of punches and matrices. He solved his difficulties by inventing a marvelous machine for cutting punches, completing it in 1884. He knew nothing of the machine or the troubles of the Mergenthaler Printing Company and that company knew naught about him or his machine, of which he had only two and needed no more. By the merest chance the existence of the punch-cutting machine of Linn Boyd Benton came to the knowledge of Philip T. Dodge, then patent attorney for the

Mergenthaler company. Dodge immediately went to Milwaukee and convinced himself of the extraordinary exactness and rapidity of the work done on Benton's machine. He brought back to New York a sample steel punch; an agreement was reached with Benton, whose invention breathed the breath of life into a business that had found itself restrained and restricted from selling its machines in sufficient numbers to make their manufacture profitable. Thus Benton saved the linotype machine, with an invention much more marvelous than the linotype machine. Fig. 6 is a picture of the second punch-cutting machine made by Benton. It was on this machine that the sample steel punch was cut for Dodge. The first Benton punch-cutting machine acquired by the Mergenthaler Printing Company was shipped from Milwaukee on February 13, 1889. In the next annual report of the Mergenthaler Printing Company appears the statement "that by the acquisition of the Benton punch-cutting machine a seemingly insurmountable obstacle to our success has been overcome." Benton did for Mergenthaler's linotype machine what Edison did for the Bell telephone—made it commercially practicable!

In the meantime, backed by Clephane and Hine, Mergenthaler was plodding along in the task of improving the machine. He produced another model, the fourth of his independent matrix machines, in 1889. It had improvements, but was not well designed and was scrapped. However, in February, 1890, a model that was virtually the linotype machine of today was completed. Mergenthaler had achieved his invention. Two hundred of the new machines were ordered, one hundred to be made in the Brooklyn factory and one hundred under contract in Mergenthaler's own factory in Baltimore, for Mergenthaler had not been reinstated in the employment of the Mergenthaler Printing Company.

With all serious mechanical difficulties overcome it became apparent that more capital was needed. Early in 1891 the Mergenthaler Printing Company (the Mills interest) and the original National Typographic Company (the Clephane-Hine interests) were consolidated in a new corporation, the present Mergenthaler Linotype Company, with a capital stock of \$5,000,000, of which each of the earlier companies received \$1,500,000, while \$2,000,000 was offered for sale. The Mills interest purchased a majority of the unallotted stock, and by doing so supplanted the Washington interest in the management. Hine ceased to be president in December, 1891, and was succeeded by Philip T. Dodge, under whose management the company achieved a success unprecedented in the history of inventions relating to printing. This success was shared in by those who had supported Clephane in his earlier efforts and in developing the various processes and machines which fell by the wayside. Mergenthaler received a royalty on every machine sold. All were happy, more or less, Mergenthaler much less than he deserved to be. The first dividend was paid in 1894. In some years the dividend has been as high as twenty per cent.

Under the administration of Hine, in 1890, the Rogers typograph appeared in the market, a slugcasting machine which was offered for sale at a much lower price than the linotype machine. After litigation, which commenced in 1891 and ended in 1894, the Rogers machine was declared to be an infringement of the Mergenthaler patents. While this litigation was in progress, the Mergenthaler Linotype Company was sued by J. W. Schuckers for infringement of his double wedge patent of 1885. The Gally single wedge was practicable with Mergenthaler's band machines, but not with his independent matrix machines. In his dilemma Mergenthaler copied the principle of the Schuckers wedge, the wedge space now in use. While the Mergenthaler Linotype Company was suing the Rogers Typograph Company for infringements, it was defending itself against Schuckers. The Rogers Typograph Company was shrewd enough to buy Schuckers' patent and continued his suit. The courts sustained the Schuckers

double wedge space patent, so that the Rogers Typograph Company was both winner and loser. The Mergenthaler Linotype Company could neither find nor devise a substitute for the double wedge justifier, and was compelled to surrender. The sum of \$416,000 was paid by the Mergenthaler Linotype Company to the Rogers Typograph Company for the double wedge justifier patent.

In awarding credit for the invention of the linotype machine it must be conceded that it would have been impracticable without the Schuckers double wedge justifiers. On the other hand the linotype machine, with the Schuckers double wedge space and its other ingenious mechanisms, would have been commercially impracticable without the illimitable and cheaply produced supply of matrices which was made possible by the Benton punch-cutting machine, and which would have been impossible to produce without that machine. Mergenthaler was a persistent experimenter, a resourceful mechanic, anything but brilliant in his ideas. His path as an inventor is that of a plodder, and is marked by an unusual number of machines that failed. Had he possessed the genius of a great inventor he would have confined his failures to paper or to experiments with the smaller but more vital elements of the machine he had in mind. Each of his laborious failures brought him nearer to the dim vision of what ultimately proved to be a simple and effective machine. He was a man of fine character and entirely conscientious, retaining the respect and friendship of his patient backers, Clephane, Hine, et al., from start to finish. Expert men who worked with him speak of him in affectionate terms. He ardently desired to produce a workable type-composing machine, and as ardently he desired to create a great new industry in his beloved Baltimore. He was not a scientific student, and repeatedly it happened that he did not begin his studies in the state of the art he was working in until he had failed to achieve practicability in following his own ideas. His relations with the Clephane-Hine interest were ideal. He suffered in spirit and in purse when the Mills interest was in power. When he left the enterprise in 1888, an ordinary man would have abandoned the invention, but he continued at his own expense to develop his latest and successful model, upon which there has been no radical improvement to this day. His name, therefore, is rightfully attached to the linotype machine, but his invention was not novel in any detail, except the important one of the single matrices and the method of distributing them. Every other detail had been used: the mold, the casting apparatus, the curving channels, the control of matrices by nicks, the keyboard. All these elements had been in use for many years, but combined in the linotype machine they were not effective without the far more scientific inventions of Schuckers and Benton.

Schuckers was mechanical expert of the Homer Lee Bank Note Company, of New York. In 1879 he patented an impression machine for making matrices, which was never put to use, but one of his claims was a graduated wedge for justifying, which appears to have been copied from the graduated justifying wedge of Gally, patented in 1872. In 1885 he patented the double wedge justifier. In this patent the two wedges were separate, moving against each other to increase or diminish the space between the words. Mergenthaler tied the two wedges together, but the courts decided that joining the wedges did not invalidate the principle patented by Schuckers.

The Benton invention is a work of genius and originality. It cuts in steel or other metals with a fineness and precision impossible to the hand punch cutter. It has cut a punch containing the longer version of the Lord's Prayer on a space the square of six points, readable only under a powerful microscope. It has cut a letter "a" on a half-point body — 144 to the inch! Of all the men whose ingenuity is exhibited in the linotype machine, Benton is the only one who has genius as

an inventor. Without his invention the work of the others would have gone for naught, even Clephane's indomitable courage and perseverance.

SUGGESTIONS FOR PLATEN PRESSMEN

BY JESSE B. HAMLIN

In this age of close competition and automatic presses it behooves any one who has to hand-feed to take advantage of any method which will help him to do fast and accurate work. The following devices have been in use by the writer for at least fifteen years in a two-platen shop, and their usefulness for a plant of that size can not be questioned.

A corset steel or clock spring cut into pieces of various lengths and pointed at one end is a most useful aid for rapid, accurate feeding. It can be inserted in the tympan as an end gage where it is necessary that gripper be used on left-hand margin; it can be used as an extension tongue to keep sheets down to the gages; with cork attached to one end it makes an excellent device for eliminating slurring; if paper is cut true it can be used as a "back stop" to prevent sheets from jumping, and for this purpose it is inserted point toward the feeder and snug against the end of the sheet, about an inch from below right-hand corner.

It is an easy matter for the average feeder to get a sheet to the gages but a difficult one to keep it from jumping when the platen is a little shivery and the press running more than twelve hundred impressions an hour. By bending one of the "points" in the shape of a question mark and inserting it in the tympan at the lower right-hand margin of the sheet with lobe resting on it to act as a clamp, the feeder will experience no difficulty in keeping his sheets from jumping. Of course it should be so adjusted that the sheet will slide under it easily and at the same time hold it firmly enough to keep the air from forcing it back. If gages of the double-grip variety are used the tongue of the gages may be used in place of the steel point. The feeder will probably experience a little difficulty at first, but if he persists he will find that he will soon be able to give his sheet just the right shove to get it down, thereby being able to speed up his press considerably, with the assurance that his work is being accurately done.

Probably the most annoying thing the pressman has to contend with is the drying of ink in cans. In preventing waste from this source the writer takes the lid of a newly opened can and punches a hole in its center, then attaches a kettle knob. Now with a pair of tin shears he carefully cuts around the edge of the lid so it will fit snugly inside the can. By pressing this disk on the ink with enough pressure to cause a small ring of ink to ooze around the edge he will have no more trouble with scumming. Before the lid is removed from a can fixed in this manner the hardened ink around the edge should be scraped away. If the ink is so heavy bodied that the disk bends when being removed, the lid should be replaced with one of heavy zinc or aluminum.

In perusing articles in THE INLAND PRINTER regarding platen presswork the writer is astonished to note the number of pressmen who advocate the use of quads as gages. With the number of excellent gages on the market there is no excuse for using quads, which are cumbersome and entail a decided waste of time.

The use of news-print for tympan should be avoided as much as possible. By using three or four sheets of manila or book paper and top sheet with plate under all, a much sharper, cleaner impression with less patching and cutting-out can be obtained. The mark-out should be placed on sheet just above the plate. The writer does not advocate putting the plate next to the top sheet unless the type is new. News-print should be used when a form of solid type is to be printed. One sheet of news under the top sheet and three of book under make an excellent tympan when the form is partly solid.