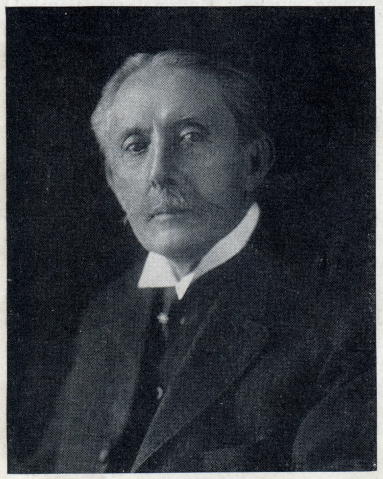
Origin and Development of the Lanston Monotype Composing Machine*

BY HENRY LEWIS BULLEN

OF all successful composing machines, the monotype is mechanically the most original, ingenious and interesting; yet, notwithstanding its world-wide use, very little of its history has been printed, and little is known of Tolbert Lanston, the man who invented it. This is also true of J. Maury Dove, the president of the Lanston Monotype Machine Company, the first title of which was the Lanston Type Machine Company, who did for the monotype machine what the indefatigable Clephane did for the linotype — nursed it from impracticability to success. Nor has sufficient honor been accorded to the late William Sellers Bancroft, a master of mechanical principles and operations, who applied his genius to make practicable the ideas of Lanston. To a large extent Bancroft created the machine as it exists today.

Lanston and Dove were also fortunate in securing, in the earlier stages of the invention, the assistance of Harold Malcolm Duncan, now managing director of the Lanston Monotype Corporation, of England, who had a more intimate knowledge of type-composing machines and typography than either of them, and thus was of invaluable assistance in creating the monotype system of type composition. There is not, I believe, in any printing trade periodical any history or portrait of these men, which fact, if it is a fact, adds to the pleasure of the compiler of this essay, who is indebted to the courteous assistance of Duncan for the illustrations of the machines, the technical details and most of the history. All sentences within quotation marks were written by him.

The name of Linn Boyd Benton must also be associated with the success of the monotype machine. His invention of the punch-cutting machine, for which no substitute has yet been devised, was as vital to the monotype machine as it was to the linotype, linograph and monoline machines. Without Benton's brilliant invention, all these machines were impracticable, because the rapid and economical production of punches and matrices was the prime need of each of them. A biography of Benton appeared in THE INLAND PRINTER for October, 1922. He is now director of the general manufacturing department of the American Type Founders Company.



TOLBERT LANSTON.

WILLIAM SELLERS BANCROFT.

J. MAURY DOVE.

The Men Who Made the Lanston Monotype Composing Machine

HAROLD MALCOLM DUNCAN.

A principal in establishing the monotype system of type composition, and the first to introduce the machine to the printing world. Mr. Duncan furnished much of the data used in this essay.

Tolbert Lanston was born in Troy, Miami county, Ohio, on February 3, 1844. He received a public school education until the age of fifteen, after which he was self-supporting. He lived in Ohio and in Iowa until the Civil War, in which he took his part as a volunteer. At the end of the war, being then twenty-one years of age, he became a resident of the city of Washington, his first employment being a clerkship in the Pension Bureau. He subsequently became chief at various times of four of the divisions of the Bureau. He studied law, was admitted to the bar, and practiced his profession to some extent. His forte, however, was invention. At various times he invented and patented many useful contrivances for a variety of purposes, among other things, a mail bag lock, an hydraulic dumb waiter, an adjustable dumb waiter and an adding machine. From some of these earlier inventions he derived a moderate income and a degree of celebrity.

*NOTE.—This is the fifth article in the series setting forth the transition from hand-set to machine-set composition.

Probably his attention was directed to typesetting problems through his acquaintance with Colonel Seaton, whose father had been of the firm of Seaton & Gales, owners of newspapers in Washington and in Raleigh, North Carolina, and government printers for several years, when governmental and congressional printing was done by contractors. After the war Colonel Seaton became director of the census. Lanston was a visitor to the Census Bureau at a time when Herman Hollerith was developing his now famous tabulating machine. Lanston is said to have given close attention to this machine, one of the first to classify and tabulate statistics by means of perforations in cards, transferable to a multiplying machine which was controlled by the perforations. It is by such conjunctions of events and acquaintanceships that many other great inventions have been initiated. It is said that Colonel Seaton was the first to assist Lanston financially in putting his ideas relating to type composition into mechanical form, but his place as a financial supporter was at an early period in its history taken by J. Maury Dove.

FIG. 1.— Lanston's first keyboard. Its action was mechanical. Lanston's next keyboard was pneumatic — the same in principle as the present keyboard.

The first experimental machine was made in the shop of D. Ballauf, machinist and modelmaker. The experimental work on the pneumatic keyboard was done in the factory of Pierce-Taft Manufacturing Company, to which company Lanston came with his ideas, to interpret which the preliminary drawings were made in that factory under Lanston's directions. The survivors of the Pierce-Taft staff who were active in Lanston's time have most friendly recollections of him as a man, and hold a high opinion of his ability and ingenuity as an inventor in an untried field. Whatever the abilities of those who had a better knowledge of applied mechanics, and notwithstanding the essential improvements subsequently made by Bancroft and his assistants and successors, it is clear that the chief devices which make monotype machines effective were original with Lanston, and that without Lanston the monotype machine would not now exist. It is also true that without Bancroft or another man of equally ingenious mind the machine could not have been perfected.

Tolbert Lanston superintended the manufacture of the earlier machines, which were made in Washington. In 1896 he was awarded the Cresson gold medal for original invention by the Franklin Institute, of Philadelphia. Early in 1898 he discontinued his connection with the manufacturing department and assumed an advisory relation with the company. "He was a man of extremely pleasant personality, with clearly defined views and much tenacity in upholding them. He was of more than average height, courteous in manner and lucid and fluent in expression." Lanston died on February 18, 1913, in Washington, after having been incapacitated for several years from active work through partial paralysis. He is survived by a second wife; by a son, Aubrey Lanston, a writer; a grandson, Aubrey Gilpin Lanston, an officer in the United States Navy, and by a granddaughter, Marjorie Beattie Lanston.

Lanston applied for his first monotype patent in 1885. It was granted in 1887. The invention consisted of a keyboard machine and a typemaking and typesetting machine. The keyboard embodied the means of exact justification, which is still the most important feature of the monotype machine. Lanston's earlier machines were controlled by two perforated records, one to position the matrix, the other to effect justification of the lines. Later on, Lanston achieved control of all operations with one perforated strip. Both parts of the invention as expressed in the first machine were actuated electrically, but Lanston soon substituted the present pneumatic operation. Fig. 1 shows Lanston's first keyboard. It was actuated mechanically, but in his next keyboard pneumatic action was used. Fig. 2 shows the first keyboard made by Bancroft for his limited font monotype machine of 1897. In this keyboard Bancroft reverted to mechanical action, but experience proved the superiority of Lanston's pneumatic actuation, which was reinstated, and is in use in the present machines. Since then many changes in details have been made, but none in the principle of operation. The keyboard is the vital factor in monotype composition. It is a monument to Lanston's genius, unshared in its principles by any other person; but as now made it owes its effectiveness in a large measure to Bancroft and his mechanical staff and their successors. Many otherwise expert inventors have since attempted to effect exact justification of single types, but invariably without success. Lanston, in 1887, solved this problem, the stumbling-block in the path of all other typesetting machines, in the only way, it would seem, in which it can be done.

The first monotype typemaking and type-composing machine is shown in Fig. 3. This 1887 machine did not cast types. It pressed single types out of cold metal supplied to the machine in long type-high strips, shaved to the required body. One of the perforated records set the metal strip in motion and controlled the extent of its travel to correspond with the width of the character to be made — an i or a w or other letter or space — whereupon the required width of metal was automatically cut off from the metal strip, and was passed into a compression box, which corrected the irregularities in the body of the cutoff piece, and held it while the desired character was impressed on its exposed end by means of a steel female die or matrix, of which there were sufficient for 196 characters. The case holding the matrices was positioned by the second record strip. The copy to be set governed the order in which the types were to be made. As the types were completed, they were assembled in lines. Each line was found to be perfectly justified when the last character was added to it. Except in the method of making the types, this first monotype machine contained all the essential principles of the present machine. However, it was immediately proved that types could not be made accurately or quickly enough by pressure in cold metal. This machine also has the distinction of being one of the first with

FIG. 2.— Bancroft's first keyboard, designed for his limited font monotype machine. In this apparatus Bancroft resorted to mechanical actuation. In this respect his first keyboard was a failure and he returned to the use of Lanston's pneumatic action.

movements automatically controlled by electricity. Commercially the machine was a failure, and required to be redesigned, but there never was a more brilliant or hopeful failure.

Lanston, encouraged and supported by Dove and other friends with ample means, proceeded to improve the invention. The second machine is shown in Fig. 4. In this the types were cast. The actuation was pneumatic instead of electrical. These were the chief improvements. The controls by two

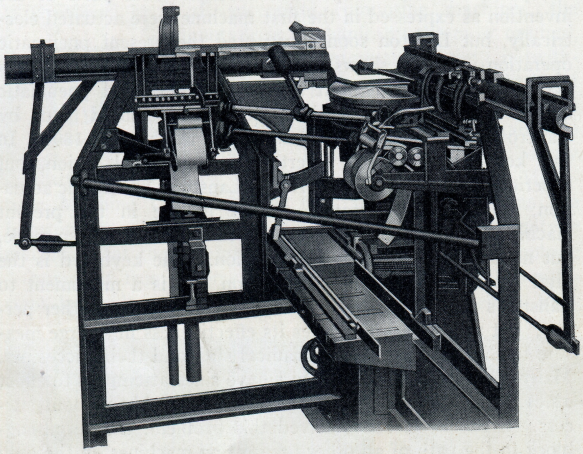


FIG. 3.— The first Lanston monotype machine. This machine made its types by compression.

perforated records and the matrix case were the same as in the first machine, but the number of characters for which matrices were furnished was increased from 196 to 210. Thus, the second machine in all its essential features prefigured the present machine, but was slow and not invariably reliable in some of its mechanisms; in short, not marketable. To increase production "it was proposed to provide the machine with three similar molds, mounted at regular intervals around the outer circumference of a rotatable wheel or disk, the idea being to bring the molds successively to the casting point, and thence to a point where the cooled type was ejected." Whatever experiments may have been made, this idea was not carried out at the time; but a quadruple machine was made and exhibited at the World's Fair in Chicago in 1893. "It had four die cases and mold actions, using four record strips and four galleys." The quadruple machine (here referred to out of its chronological order) was of the type of the third machine, also exhibited in 1893, shown in Fig. 5, but while it functioned very well, its high cost and unavoidable complications were disadvantages not to be overcome.

A long course of changes and experiments then ensued, in an effort to arrive at commercial practicability. This was not accomplished until 1897, but in the meantime such progress was made that in 1891, the first formal announcement and description of the machine was made in an article written by Duncan, and printed in types cast and composed on a monotype machine, which appeared in *Paper & Press* (Philadelphia), Vol. 13, No. 3, September, 1891. In 1893 a machine (shown in Fig. 6) with still further improvements, but not radically different from the second machine, was exhibited at the World's Columbian Exposition in Chicago. The machine then exhibited ran "quite successfully," but "left much to be desired in its design, due to the fact that the company had not yet found it necessary to employ a skilled mechanical engineer" to simplify the mechanisms. "In this machine the record strip was placed at one end and the die case and mold at the other end, the space between being occupied by the mechanism for interpreting the signals of the die-case mechanisms. The die case contained 225 matrices. These matrices were in the form of the earlier ones, being steel cubes with a soft inset of metal in the cubes to receive the indentation of the type punch. The die case itself was moved in two directions, at right angles to each other, to bring the matrix under the centering plunger. The matrix was then forced partially out of the die case and clamped upon the mold." The machine of 1894 was the first to be put into productive use in a printing house, but only one was made. It produced good types, justified them perfectly, and composed 3,600 ems an hour, nevertheless much remained to be done to make it an economical success. The first users of the monotype machines are said to have been Gibson Brothers, Incorporated, Washington. Such was the condition of the invention when Lanston ceased to superintend the constructional experiments, at which time the manufacture of the machine was placed in the hands of Sellers & Co., of Philadelphia, under the immediate supervision of Bancroft.

The sixth machine, shown in Fig. 7, appeared in 1897. It was of an entirely new design, by Bancroft, and was built by Sellers & Co. The machine was reduced in size. The scope of the die case was limited to a partial font of 132 characters, a number thought to be sufficient for use on newspapers, the field in which the monotype company then expected to find its best market. It excelled previous models in speed, simplicity and accuracy, while adhering to the basic principles invented by Lanston. The matrix case and matrices were entirely altered and standardized. "The matrices were driven in copper and inserted in short oblong blocks of steel. A conical cavity in the foot of the matrix provided the means of clamping the selected matrix over the mold. The matrices were supported in the die case in a new manner: by means of a horizontal wire all the matrices of a row were suspended in bearings in the die case. This wire passed through a horizontal opening in the matrix body. The die-case mechanism was an

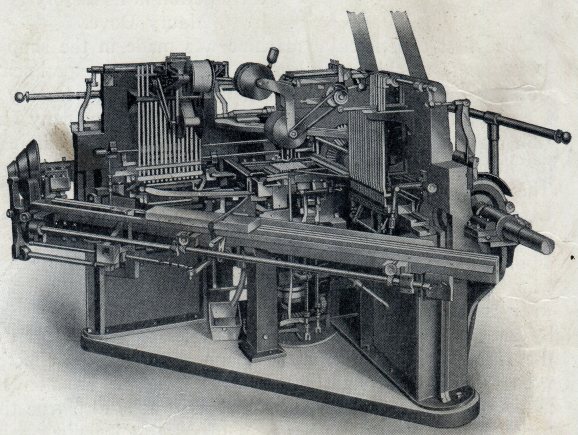


FIG. 4.—The first Lanston monotype machine which cast its types.

entirely new feature. Dimensioning devices for determining the extent of the movement of the blade were adopted, a wedge being employed for this purpose. Justifying increments were added to the spaces only. A new feature was introduced, whereby a line of inaccurate length caused a stoppage of the entire machine. The machine itself was pneumatically actuated." Thus improved by Bancroft, the sixth machine, of which more than a hundred were sold by Duncan, became the basis of the present machine.

As the users soon discovered, the chief fault in the sixth machine, of 1897, described above, was the limitation of the matrix font to 132 characters. To meet this objection Bancroft built in 1899 a full-font machine using 225 characters, in its

general construction much the same as the machine now in use, although many important improvements have since been made. The more useful an invention, the more constant is the need for its improvement. The most important advance in the 1899 machine was the die-case positioning mechanism. "In the earlier machines there were many useless move-

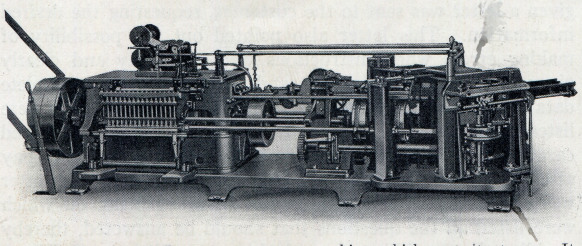


FIG. 5.—The second Lanston monotype machine which cast its types. It appeared in 1891.

ments, as the die case and coöperating elements were necessarily restored to zero position after each operation." Bancroft succeeded in making every movement effective, nearly doubling the rate of production, while insuring greater accuracy. There were numerous other improvements, a description of which would be too technical for our purpose, which users of monotype machines continue to enjoy, little realizing, perhaps, how much mental effort and how many costly mechanical experiments, frequently unsuccessful, are required to make machines meet all the needs of the users. The monotype machine, of course, is not singular in this respect. The genius and the persistency of inventors and improvers of machinery used in the printing industry have never had sufficient recognition. It is this thought that has inspired these articles.

From the first incorporation of the company owning the monotype inventions, J. Maury Dove, of Washington, has been president. He is a wholesale coal merchant, the owner of one of the principal hotels in Washington and of apartment houses, and from the beginning has been the active manager of the Lanston Monotype Machine Company. Besides devoting his time and energy to the company's affairs, he and other early wealthy friends of Lanston provided the funds which sustained it during the several years of expensive experiments and discouragements. It was not until 1896 that the company began to sell machines. In that year Duncan was appointed general

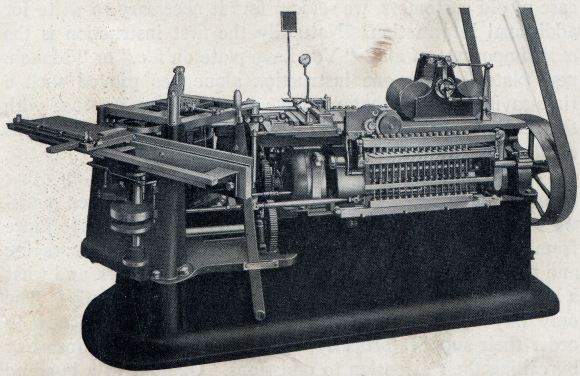


FIG. 6.—Lanston's final design of his monotype machine, as exhibited at the World's Fair in Chicago in 1893. Only one of these was made. A quadruple machine was also exhibited at the World's Fair, but only one was made. Both machines made good types, and justified them perfectly. The speed of the single machine was 3,600 ems an hour. Commercially both were failures.

selling agent within the United States. A considerable number of the limited-font machines were sold. At this time the need of a factory equipment was urgent, and funds were required to purchase it. It was decided to sell the patent rights for Great Britain and its dependencies, except Canada. Dove and Duncan took a limited-font machine (Fig. 7) to London in July, 1897, where Duncan demonstrated it to such good effect that the sale was negotiated for the consideration of one million dollars, part cash and part stock, to a syndicate of capitalists of high position, including a few leading publishers and printers, who subsequently formed the Lanston Monotype Corporation Limited, by sales of stock to the investing public. A factory was erected in which to manufacture the machine and matrices. Duncan remained for a while as technical adviser to the English company. Dove returned to America and developed the present efficient manufacturing organization. Thus the Lanston Monotype Machine Company started in its own plant on a highly successful career.

Duncan, having established the English factory, returned to assist Dove. But all was not plain sailing in England. Duncan was recalled, and not long after was appointed managing director. The English company, under his management, extended its field by acquiring all the monotype rights for Europe. The American and British companies are quite independent of each other, though interchanging ideas and improvements in a most friendly spirit.

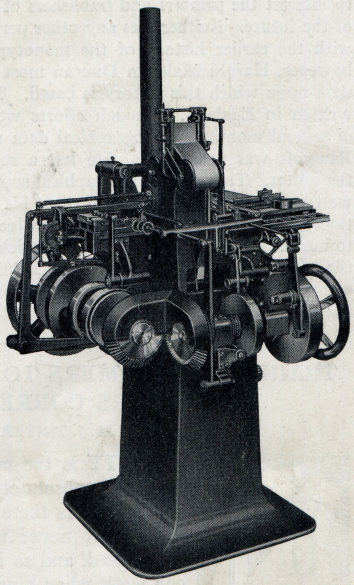


FIG. 7.—First monotype machine designed by Bancroft; the first to gain a market and have an extensive use. It is known as the "Limited Font Machine," having matrices for only 132 characters. Bancroft steadily improved upon his first model until his death. He gave complete effect to Lanston's ideas and thus became co-inventor of the Lanston monotype composing machine.

The British monotype factory is in charge of Frank Hinman Pierpont, an American, who was enlisted by Duncan when he was organizing the British factory. Before that Pierpont was the director of a German company manufacturing the Rogers Typograph in Berlin. He is an inventor of marked ability and success. The factory at Horley, about fifteen miles from the center of London, is a model in all respects, equipped with the latest effective precision machines. Under Pierpont's management the technical staff has extended the Benton system of punch cutting to meet more completely monotype machine needs, and has perfected a most ingenious system for producing punches and matrices with great accuracy and the utmost speed. In this system various automatic appliances for testing the accuracy of the matrices are singularly effective. The high reputation which the English company enjoys in Great Britain and in Europe is based chiefly on the close and esthetic attention which has been given to its type faces from the beginning by Duncan. A short biography of Pierpont and a portrait were included in the history of the typograph in our preceding issue.

Harold Malcolm Duncan, whose services have been of so much benefit to all users of monotype machines, was born in Philadelphia on October 29, 1864. On the female side he descends from a family which acquired an estate in Pennsylvania by purchase from William Penn, the founder of that commonwealth. Duncan received his education in Philadelphia, partly by private tuition. His first occupation was that of journalist. He proceeded to technical journalism, editing and publishing technical journals and books in New York. In

this relation he acquired a technical and artistic knowledge of printing. He also made an acquaintance with Lanston, which developed into close friendship. Lanston sought his advice. A visit to Washington to inspect Lanston's invention was also the beginning of a close friendship with Dove. In 1896 he joined his fortunes with the Lanston Monotype Machine Company and was a principal in establishing the monotype system of composition. He was the first to introduce the monotype machine to the printing world, and has at all times been one of the small group of men who have patiently brought the invention to its present state of effectiveness. His services to the English company have been recorded in preceding paragraphs of this article. * * * *

NOTE.—A long continued serious illness of J. Maury Dove has prevented the writer from including in this essay a biography of that distinguished fosterer of Lanston's invention. No other person, it seemed, could give the required data, which could not have failed to interest the printers and publishers of the present time and also of the future. Neither was any other person in America acquainted with the earlier history of the monotype machine. In England, however, Harold Malcolm Duncan most courteously furnished the data upon which this history is based. Thus the essay came to be written in England. Though efforts were made during a period of several months, no biographical data relating to William Sellers Bancroft was procurable. He left a son, who declined to assist the writer. Therefore, a biographical supplement is required, which we trust Mr. Dove will supply upon his recovery, with such additions to and corrections of this narrative as he alone is competent to make. The next and concluding article in this series will narrate the effects upon the typefounding industry of the inventions of composing machines, and how the typefounders adjusted themselves to the new conditions.

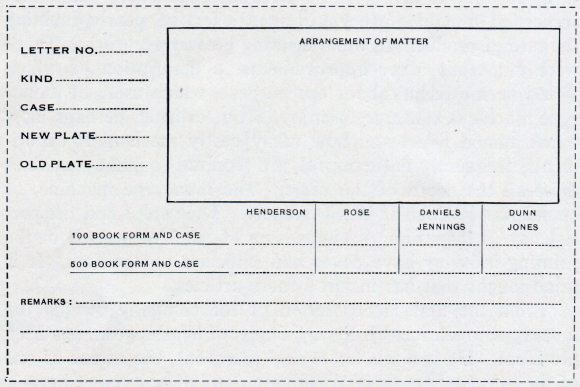
TRAINING CUSTOMERS TO SEND IN THEIR ORDERS CORRECTLY

BY M. J. TINTERA

NECESSITY is the mother of invention, and when it is absolutely necessary to get down to brass tacks there is always a way out of things. It never rains but it pours, and pours hard, and so it happened in our plant one week when nine invoices were returned with requests for credit on items for engraved plates, plates which we had engraved anew. These plates should have been on file from previous orders, and when samples were furnished we found that we actually had them filed away among the thousands of others in our vault filing room.

On investigation we found that these errors were due simply to customers' failure to send explicit instructions with their orders. A customer sending an order with copy for some engraved business cards would fail to enclose a sample, or he might forget to state whether the card had been engraved before or whether a new plate was to be supplied. In a case of this kind the order would be sent out to the file clerks and they would make a thorough search through the alphabetical rows of drawers containing engraved plates, wasting a lot of time to make sure there was no plate on hand, and finally return the order to the office order department with the notation " No plate on file." An order would then be issued for a new plate, the department using its own judgment as to style and arrangement, and working up instructions that should have been written plainly on the original order, thereby taking a chance that the judgment used might not be satisfactory to the customer.

Customers are satisfied and dissatisfied in streaks. Days and weeks will go along without a word of complaint, and then in one morning's mail will come a dozen or more protests about things on which we have used our own judgment. This matter of guesswork is too expensive in the engraving business, therefore when the storm of duplications of engraved plates broke out we decided that something had to be done, and we did it quickly. Several forms were prepared, form letters were multigraphed, and incoming orders were watched closely. When we received an order on which instructions were not clearly given a letter was sent to the customer, requesting the desired information. This letter also pointed out the possibility of making errors when instructions were not fully and clearly given with the original order, and the necessity for complete data for the correct filling of the order. These customers were listed alphabetically and their future orders were watched carefully. Only about one out of every twenty failed to pay attention to our form letters. In such cases a second letter was sent and enclosed with it was an order blank on which were listed all the questions that should be answered, thereby avoiding the possibility of overlooking some little item. Where a company sent in a number of orders a pad of these order blanks was mailed direct to the purchasing agent, and while


LETTER NO.....
KIND.....
CASE.....
NEW PLATE.....
OLD PLATE.....

ARRANGEMENT OF MATTER

	HENDERSON	ROSE	DANIELS JENNINGS	DUNN JONES
100 BOOK FORM AND CASE				
500 BOOK FORM AND CASE				

REMARKS:.....

Blank Designed to Avoid Lack of Explicit Instructions

he used his own company's order forms for records and order numbers, he found our blanks handy for all instructions as to style, quantity and copy.

This method of bringing the customer's attention to the absolute necessity of giving explicit instructions with all orders sent in has proved a success in every respect. Today, in the case of old customers, we seldom find it necessary to write for additional information. Naturally the first instruction is the most important of all —" You have plate on file," or " Make a new plate." This one instruction alone has proved such a time-saving feature that we have been able to dispense with the services of two file clerks, not to mention the duplications of plates we have avoided.

Where one company controls probably six or seven other interests, each listed under individual firm names, even guesswork is impossible unless an exact copy is given. Yet, to judge from the orders sent in, many customers believe an engraving and printing concern to be composed of mind readers, and what a howl they set up if their minds are not read correctly! The only way to solve the problem is to teach customers how to order their supplies properly, by sending them order forms or by calling their attention to omissions. One out of a hundred may resent the seeming intrusion, but the other ninety-nine will thank you courteously for helping them to avoid mistakes.

SELF-RELIANCE

It is easy to see that a greater self-reliance — a new respect for the divinity in men — must work a revolution in all the offices and relations of men; in their religion; in their education; in their pursuits; their modes of living; their association; in their property; in their speculative views.—*Emerson.*