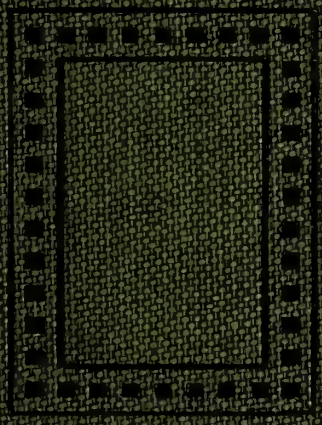
STEREO TYPING

By C. S. Partridge



Why ask for the moon
when we have the stars?

AS

STEREOTYPING

A PRACTICAL TREATISE OF ALL KNOWN METHODS OF STEREOTYPING, WITH SPECIAL CONSIDERATION OF THE PAPIER MACHÉ PROCESS

TO WHICH IS ADDED AN APPENDIX GIVING CONCISE INFORMATION ON QUESTIONS MOST FREQUENTLY OVERLOOKED

BY C. S. PARTRIDGE

SECOND EDITION
Revised and Enlarged

▲ ▲ ▲

CHICAGO AND NEW YORK
THE INLAND PRINTER CO.
1909

CONTENTS.

PUBLISHER'S PREFACE.

"STEREOTYPING by the Papier-maché Process," by C. S. Partridge, first appeared in 1892, and at once became a standard work for practical men, the author being an experienced and practical stereotyper and having an extensive acquaintance in the trade through these qualifications.

This second edition of his work, revised by Mr. Partridge, has been brought thoroughly up to date and many features added to make it as helpful as possible to the student and more experienced operative.

THE INLAND PRINTER CO.

CHICAGO, March, 1909.

STEREOTYPING.

CHAPTER I.

INTRODUCTION.

THE history of the practical application of papier-maché stereotyping to newspaper work covers a period of less than fifty years, but in that brief time its influence has been felt all over the civilized world.

The early experiments of Vanoni and Dellagana in London, and of Charles Craske in New York, resulted in the adoption of the papier-maché process by the London *Times* and the New York *Tribune* and *Herald*. To-day every newspaper in the world recognizes the value of the invention and makes practical use of its products.

The rotary press, with its printing capacity of 50,000 sheets per hour, owes its existence to the papier-maché process of stereotyping, whose flexible matrices permit the casting of curved plates, whereby the printing surfaces are transferred from the bed of the press to the cylinder. The limited speed of a reciprocating bed has thus been exchanged for the continuous revo-

lutions of the plate cylinder, and the capacity of the press increased a hundredfold.

Another important advantage of the papier-maché stereotyping is found in the rapidity with which plates may be reproduced for duplicate presses, thereby providing a means by which a number of presses may be started almost simultaneously and the largest editions of the metropolitan papers printed in a few hours.

Let the novice imagine himself in the office of a great daily paper. The hour is midnight and an army of compositors are "setting up" the forty pages of matter for the next morning's edition. As fast as each page is made ready it disappears down the elevator shaft to the stereotyping room until at last only one form remains to complete the paper. The hour is growing late; in thirty minutes 5,000 papers must be printed and folded ready for the fast mail.

Let us follow this last form to the stereotype room. As the electric bell rings announcing its arrival on the stereotyping floor, two workmen, clad only in overalls and sleeveless undershirts, quickly slide the form on the bed of a rolling machine. One of them planes it down, another oils it, and a third lays the prepared flong on the type and covers it with a felt blanket. So far but a fraction of a minute has been consumed, and in thirty-five seconds more the form has been passed forward and back under the roller. This last page is a "news" page and has in it no large spaces to require "packing," so it can be immediately covered with half a dozen drying blankets and placed on the steam press to dry. Two minutes are allowed to set the matrix and then the form is withdrawn from the press

and the matrix placed on the "scorcher." In one minute more the matrix is dry, and quicker than the time it takes to tell it the margins are trimmed and the matrix adjusted in the auto-plate machine, which automatically casts, shaves, trims and delivers ready for the press curved stereotype plates at the rate of three to four per minute. One after another, the huge presses are started, and soon, with tremendous roar and din, the full complement of machines are vomiting forth the printed, folded and counted sheets, with a rapidity and an accuracy of execution that seems little short of miraculous. Compare one of these modern machines with the printing-press of thirty years ago, and some idea will be gained of what stereotyping has done for the newspaper.

But it is not only the great metropolitan papers that are indebted to the stereotyping art. Many a country daily owes its existence to this same invention, and nearly all the smaller dailies throughout the towns and cities of the country are glad to avail themselves of the advantages which it places within their reach.

Let us go, for instance, to the office of a plate-supply house in Chicago. Here we may see enacted many of the scenes which we have witnessed in the newspaper office. The difference consists chiefly in the fact that in the newspaper office sixty pages are often prepared for a single paper, while here a single page is prepared for a hundred papers. Early in the morning the editors and compositors begin their work, and at half past six the form is ready for the stereotypers. As early as seven o'clock trains begin to depart from Chicago for the principal towns and cities within a

radius of two hundred miles and hundreds of columns of telegraphic news plates must be ready for shipment on these trains.

The method of molding the form does not differ materially from that employed in the newspaper office, but the subsequent operations of casting and finishing are somewhat more complicated, for here the plates are cast flat instead of curved, and are afterward sawed into single columns, trimmed on sides and ends, and an angled recess or groove cut on their under surfaces to provide a means for locking them to the bases in the form. Notwithstanding the many operations necessary in the finishing of these plates, modern machinery makes it possible to turn out every forty seconds a complete set of news plates finished ready for shipment. The country daily is thus supplied with the news of the day almost as promptly as its wealthy metropolitan contemporaries.

Nor is the matter furnished to the press restricted to news alone, as every variety of matter used in newspapers may be procured in plate form at an expense which seems trifling when compared with the cost which would ensue to the publisher were he to attempt to provide, single-handed, the same service. From an educational point of view the benefit of this service is really national, for thousands of pages of bright, fresh, interesting and instructive reading matter are scattered broadcast throughout the country, reaching every village and hamlet, whose publications would otherwise be restricted to the wealthier magazines and periodicals which alone could afford the expense of purchasing such matter for use in an individual publication.

Stereotyping provides the advertiser with a cheap and efficient method of reproducing advertising cuts, and is particularly valuable to those who make regular or occasional changes in their announcements, for by employing the separate plate and base system any number of thin plate advertising cuts may be worked in turn from a single base, thus effecting a material saving in metal and transportation charges.

The utility of stereotyping for the production of book plates and jobwork of all descriptions is too well known to need more than a passing reference. While it is inferior to the electrotyping process for the production of high-class work, yet the well-known expense of the latter process and the fact that electrotype foundries can be conducted with profit only in the larger cities where the volume of work is sufficient to warrant the employment of a large number of men, are arguments in favor of stereotyping for a large proportion of the reproductions required by the news and job printing-offices in the smaller cities and towns.

HISTORICAL.

It is not the purpose of this work to describe in detail the plaster and clay methods of stereotyping, but it may be stated in passing that the plaster process was invented about the year 1725 by William Ged, a Scotch goldsmith, and the clay process probably by a Frenchman near the close of the same century. The use of stereotype plates did not become general, however, until the beginning of the present century.

The inventor of the papier-maché process is not positively known, but the system undoubtedly origi-

nated in France. In 1829 M. Genoud of Lyons took out a patent which was evidently designed to cover this method of stereotyping, and he is by some writers credited with the invention; but, according to Thomas Bolas, member of the Society of Arts, London, England, a similar process was employed by several persons previous to that time. F. J. F. Wilson, another English writer, states that the process was introduced into England in 1846 by an Italian named Vanoni, residing in France, and that it had been in use in France for a short time previously. Mr. Wilson implies that this was the first application of the paper process in that country. That this is an error is shown by the records of the English patent office. In January, 1840, six years previous to Vanoni's arrival in England, a patent was granted to Moses Poole for "Improvements in Casting for Printing Purposes," which, judging from the description given, was fully as practical as the methods employed by Vanoni. Indeed, excepting improvements in the materials used and also in the drying apparatus, by which the time for drying the matrix has been reduced from two hours to six minutes or less, the process described by Poole is the same, practically, as that in use at the present time.

While Poole was the patentee of the process in England, he did not claim to be the inventor, for he states in his application that the invention was communicated to him by a foreigner residing abroad. As the process was in use in France previous to the time of Poole's patent, it may be supposed that he obtained his information from a resident of that country, and possibly from Vanoni.

The man most prominent in the development of papier-maché stereotyping in its earlier history probably was James Dellagana, an Italian who became familiar with the process in France, and who was employed by the London *Times* to conduct a series of experiments with the object of duplicating the forms of that journal in order that additional presses might be utilized for the printing of its rapidly increasing edition. The first plates made for this purpose were cast type-high, in single columns; later, in 1859, full pages were cast in curved form to fit the cylinders of the rotary presses in use at that time, and finally, in 1863, the casting of semi-cylindrical plates, which made possible the success of the modern perfecting press, was accomplished, and the problem of rapid newspaper printing was solved.

In America the papier-maché process of stereotyping was introduced in 1851 by Mr. Charles Craske, who was at that time a steel and copper plate engraver in New York. In 1854 Mr. Craske made the first curved plate for a Hoe rotary press in the office of the New York *Herald*. The experiment did not prove entirely successful, however, inasmuch as the process was not permanently adopted at that time. But in 1861 Mr. Craske made contracts, which he successfully carried out, to stereotype the regular editions of the *Tribune, Times, Sun* and *Herald,* and from that time the use of stereotype plates in these offices has been continuous.

An important and constantly increasing business which originated in England in 1858, but which has found its highest development in this country, is the manufacture, at central points, of stereotype plates of

ready-set matter for the use of the newspaper press, by which means the cost of composition is practically divided among a large number of publishers. The originator of this plan was Mr. Isaac Heyes, of Sheffield, and it was developed into a lucrative business by the National Press Association of London. The plates sent out by that company were cast in single columns, type-high and all metal. They were therefore quite heavy and the cost of transportation soon became a serious item of expense.

In August, 1871, B. B. Blackwell of New York invented a stereotype plate which could be made in two parts consisting of a block or base and a thin surface plate so arranged that they could be readily separated or locked together in the form. The advantage of this plan was that the bases could be kept permanently in the offices of the publishers, and after the first shipment the surface plates only required transportation. The saving thus effected in freight charges and in the quantity of metal required to conduct a business of this kind was very material. The utility of this form of plate was at once recognized, and other devices having the same object in view were patented in quick succession.

In America Mr. Blackwell was the first to engage in the business of manufacturing stereotype plates for the country press. He continued the business but a few months and was followed by M. J. Hughes, of New York, who manufactured a plate of his own invention. Mr. Hughes shortly sold his patent to Damon & Peets, of the same city, who developed a successful business which they carried on without competition for several years. They were followed by S. P. Rounds, A. N.

Kellogg, The Chicago Stereotype Works, The American Press Association, and others. The present proportions of the business are such that there are few newspapers in this country or England, outside of the metropolitan dailies, whose publishers do not make use of ready-set matter in plate form.

CHAPTER II.

THE FLONG.

STEREOTYPING is the art of duplicating, in solid metal, type or cuts composed for printing.

There are three methods of stereotyping: the Clay process, the Plaster process, and the Papier-maché process. Of these the two first named are practically obsolete and a detailed description of them will be omitted.

The processes in practical use are the ordinary papier-maché and its modifications known as hot methods, and several cold processes.

Strictly speaking, the term papier-maché is not rightly used, but since it has come to be so well known under this name, or as "The Hot Stereotyping Process," and such usage having received practically universal sanction, it will be referred to under this name. It is, however, interesting to glean from early technical works dating back to 1809 the method of producing the bona fide papier-maché. "This is a substance made of cuttings of white or brown paper boiled in water, and beaten in a mortar into a kind of paste, and then boiled with a solution of gum arabic or of size to give tenacity to the paste, which is afterward formed into different toys, etc., by pressing it into oiled molds. When dry it is done over with a mixture of size and lampblack, and afterward varnished." The "size" referred to is a

kind of glue that was made in those days by boiling in water and straining shreds or parings of leather, parchment or vellum.

The papier-maché process may be briefly described as follows:

A few sheets of thin paper are soaked in water until soft and then pasted together to form a flong. This flong is beaten into a page of type and dried, thus forming a matrix to receive the molten metal, which, when cooled, becomes an exact duplicate of the type page.

A large number of duplicate casts may be made from the same mâtrix, either in flat form as required for flat-bed presses, or curved to fit the cylinders of rotary presses.

The advantages which the papier-maché process possesses over the clay or plaster methods are the ease and rapidity with which the matrix may be made, the large number of casts that may be obtained from it, and the flexibility of the matrix, which admits of its being curved without injury to fit the semi-cylindrical casting boxes in which stereotype plates for rotary presses are cast.

The first step in the art of papier-maché stereotyping is the construction of the flong, which is accomplished by pasting together two sheets of soft, tough matrix paper (which have been previously softened by soaking in water) and four sheets of strong tissue paper.

In the earlier days of stereotyping it was exceedingly difficult to obtain paper combining the qualities of softness and toughness, and it was only after

repeated experiments that manufacturers succeeded in producing, in the required degree, these most necessary features. There are now, however, several mills in this country and Europe which manufacture a special grade of paper for the stereotyping trade. These papers are not all alike, but vary in texture and weight to suit the requirements of different kinds of work. In all matrix papers, however, which are used in the brush method of molding, it is essential that the fiber shall be long and strong and yet soft and elastic.

It is the custom with most stereotypers to use two kinds of matrix paper in the construction of the flong, the sheet to which the tissues are pasted and the backing paper, which is usually added to the flong after it has been beaten into the form.

MATRIX PAPER.

To secure the best results with the least labor and expense the matrix paper proper should weigh about forty pounds to the ream, size 20 by 24 inches. A lighter paper would be found difficult to make up without tearing, and if much heavier it would require unnecessary labor to beat it into the form.

The best weight for the second or backing sheet depends upon the material used for filling in the spaces or depressions in the back of the matrix. When "backing powder" is employed for this purpose any common, medium-weight paper will answer for the back, for it does not require to be beaten into the form and can therefore be less tough and elastic than the first sheet. If, however, no backing powder or other filling material is used for packing the spaces the backing

paper should be about twice the weight of the first sheet, and should also be of fair quality, as it must be beaten into the type in order that perfect unison between the back and the flong may be assured, particularly in the spaces where the greatest strength is required.

The tissue paper used in the manufacture of the flong is of two kinds, a heavy white and a fine, medium-weight cream tissue. The cream tissue is made of rice straw, is smooth and strong and must be free from pinholes or other defects. When both white and cream tissues are used the white is laid on first, next to the matrix paper, and the cream is used for facing. Usually two sheets of each kind are employed, but the custom varies in different offices, some stereotypers using three sheets of white and one of cream, and others using one of white and three of cream.

STEREOTYPERS' PASTE.

Stereotypers' paste for uniting the different sheets of paper in the flong may be made in a variety of ways, few workmen using exactly the same recipe. All pastes, however, contain practically the same chemical ingredients, although they may vary in proportions. The materials most commonly employed are starch, glue, a mineral or chalk and a preservative.

A good paste may be made of starch and flour, but the addition of a proper proportion of glue and a mineral filler give it a desirable paintlike quality of forming a skin or film on the surface of the paper instead of soaking into it, as flour paste will do. To preserve the paste from fermentation, alum, carbolic acid, oxalic

acid or essential oils are employed. When the mineral ingredient is added to the paste after it is cooked, alum is found to be the best preservative, but when the mineral is cooked with the other ingredients carbolic acid should be employed, because alum, when mixed with alkalis in water, creates a chemical disturbance which impairs the adhesive qualities of the paste.

A great variety of materials are used by different stereotypers in the manufacture of paste, among which may be mentioned wheat flour, rye flour, farina; corn starch, potato starch, arrow root; glue, gelatin, gum arabic, gum acacia, dextrin; china clay, kaolin, paris white, barytes, ocher, litharge and zinc white.

It will be noticed that these substances virtually are equivalents of those first mentioned, and possess no special advantages over them. A dozen or more recipes might be given, in which these different materials and the proportions employed could be varied to a considerable extent.

Following is a paste recipe which has been used by the writer with uniform success: Two and one-half pounds Oswego starch (corn flour); one-half pound flour (wheat flour); six ounces dextrin. Dissolve in 10 quarts of cold water and add one ounce powdered alum. Cook (in a steam-jacketed kettle if possible) until the mixture boils thick. This paste may preferably be used without the addition of whiting or other flour.

Stereotype paste is sometimes cooked by means of steam introduced directly into the vessel containing the materials. In this case some of the steam is condensed and adds to the quantity of water in the paste. It is

obvious that when paste is cooked in this way less water will be required than when it is cooked over a fire or by means of a water bath. How much less depends on the dryness of the steam used? This is a point not easily determined, and it is more satisfactory, therefore, to do the cooking over a gas stove, unless a large quantity is required, in which case a copper kettle surrounded by a steam jacket will be found convenient.

While the paste should never be overcooked, yet it is important that it should be cooked thoroughly — that is, the entire quantity should come to a boil. In a steam-jacketed kettle the mixture will boil first around the edges of the kettle; hence to insure thorough cooking, it should be allowed to boil three or four minutes after the first indications of boiling are seen. Whether the paste is cooked by a steam jet or in a steam kettle it should be stirred continually, both to prevent lumping and to insure thorough mixture and assimilation of the materials. When cool, the paste should be of the consistency of thick cream. If too thick to spread easily a little water may be added, but it is not advisable to add more than a very small quantity, as the adhesiveness of the paste will be thereby impaired.

PASTE RECIPES.

Here are several recipes for stereotypers' paste, all of which are recommended by practical men: 6½ pounds of Oswego starch, 2½ pounds of flour in 6 gallons of water. Then add 12 ounces of common glue, previously dissolved in 2 quarts of water, and 2 ounces of powdered alum. Cook until the mixture boils thick.

The *British Printer* recommends the following:

Dextrin, 1 pound; flour, ½ pound; starch, 1 pound; glue, ½ pound; whiting, 2 pounds; water, 5 quarts, and a few drops of carbolic acid. First dissolve the dextrin in about a quart of boiling water, stirring until a stiff, gummy solution is obtained. Having made the starch into a paste by the addition of cold water, the resulting thick liquid is poured into the dextrin while it is still boiling. The paste and dextrin together should thicken almost immediately. Stir well, and after a short time treat the flour exactly as the starch and add the compound in a cold state. Having arrived so far, add the glue — soaked over night and reduced to thick liquid form — and continue stirring. The whiting is next taken in hand. This is crushed to a fine powder by the addition of cold water, converted to a thick paste, and in its turn added to the ingredients in the pot. The carbolic acid is added last.

Here is one more: 10 ounces of gum arabic dissolved in 1½ pints of water; 4½ ounces of flour; 4 ounces of starch; 5½ ounces of china clay in 1½ pints of water. Mix together and simmer over a slow fire. Do not let it boil.

ROLLER-PROCESS FLONGS.

Flongs designed for the roller process of molding require a different paste and a softer paper than is used for the brush process. Usually two sheets of very thin blotting paper are pasted together and interlaid between the heavy blotter and the tissue paper.

Here are two recipes for roller paste: 3 pounds of wheat flour and 4 quarts of water. Mix until all lumps are out of the flour. Have this in one pan. In another

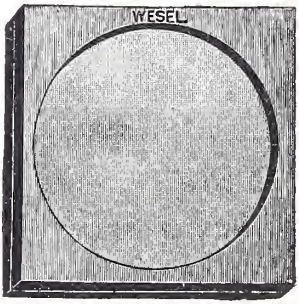
pan 12 ounces of starch and 3 ounces of carbolic acid and 2 quarts of water. Stir until the acid and the starch are dissolved. Mix all the contents of both pans together and boil until the paste will run in a string from a stick; when cool keep in earthenware jar. This is a stock mixture which is used in making two kinds of adhesives, as follows: For back paste, take 2 pounds of the stock mixture, 5 ounces of whiting, and 2 ounces of dextrin. Mix together well, add water enough to thin to suit, then pass through a sieve. For the face or tissue paste, take 2 pounds of the stock mixture and 2 ounces of whiting. Mix thoroughly, add water to thin and also pass through a sieve. If the tissue sheets do not stick well the paste is too thick; thin with gum water made by dissolving two ounces of gum arabic in one quart of water. A second roller paste recipe is as follows: 15 pounds of bolted whiting and 5 pounds of Oswego starch, known abroad as corn flour, in 22 quarts of water. The paste should boil slowly, with constant stirring, for ten or fifteen minutes. A little carbolic acid may be added to preserve the ingredients.

Another roller paste recipe calls for the mixture of 1½ pounds of starch, 2½ pounds of gilders' whiting and 3¼ pounds of dextrin in water, and cooking as in the previous instance.

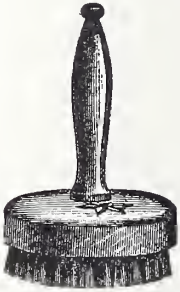
PASTE SIEVE AND SIEVE BRUSH.

The sieve and brush used in preparing the paste are manufactured specially for the purpose, the former being in the form of a basin with sieve bottom, secured in a wooden frame so that the sifted paste will fall into another basin beneath. The brush is circular in form,

made of stiff bristles and provided with a handle to facilitate its operation. Both sieve and brush should be thoroughly washed as soon as possible after using, as it is no easy matter to clean them after the paste has dried.



PASTE SIEVE.



SIEVE BRUSH.

PREPARING MATRIX PAPER.

Matrix paper, before it is made up, should be softened by soaking in water. For this purpose a zinc-lined sink, provided with a waste pipe and a stopcock, is usually employed. Sufficient paper for the next day's use is placed in the sink and covered with a flat plate of brass, zinc or stereotype metal. The sink is then filled with water and the paper left to soak until needed, when it is placed on a table or flat plate and the superfluous water removed by rolling over it a heavy cylinder of wood or metal. One sheet of the paper is then laid on a smooth stone or iron-topped table and covered with a thin layer of paste, which is

well rubbed in with the brush. A sheet of tissue is then laid on, one end being held up by an assistant to prevent contact with the pasted sheet, and with the hand or an iron rolling-pin the operator smoothes or rolls the tissue into perfect contact with the matrix paper, taking care to prevent the tissue from wrinkling. A little more paste is then spread on the tissue thus laid, a second sheet of paper added in the same manner, and so on until four sheets of tissue have been laid and the flong is completed. A second sheet of matrix paper is

Paste Brush.

now laid on top of the first flong, and a second flong constructed in the same manner as the first. When the required number of flongs have been made they are placed under a wet blanket to prevent evaporation, and may be used at once or kept several days, provided the blankets be dampened occasionally.

CHAPTER III.

PREPARING THE FORM.

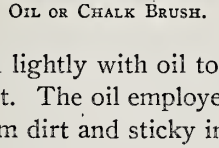
TYPE or cuts which are to be stereotyped should be clean, carefully justified and surrounded by type-high bearers. When type is made up in full pages, for newspaper work, it is customary to employ type-high chases, with type-high foot and side sticks, the latter being made wedge-shaped to provide a means for locking up the form. A hardened steel screw passes through a threaded hole in the lower end or foot of the chase opposite the larger end of one of the wedge-shaped side sticks, which, being operated by a socket wrench, serves to force the wedges together, thus locking the form in the direction of its width, while additional screws, impinging against the foot stick, serve to complete the lock-up.

It is sometimes a matter of difficulty to unlock the side sticks. To overcome this difficulty some manufacturers of chases recess the end of the wedge, turn a shoulder on the end of the screw, and then, by means of a split collar, secured to the side stick, the screw is made to operate both ways, drawing the wedge out as well as forcing it into position. When this is not done it is necessary to loosen the wedge by driving, and in this case a piece of soft metal should be placed against the small end of the wedge to receive the blow of the mallet and protect the side stick from injury.

The upper inside corner of the chase and also of the foot and side sticks is beveled to provide a recess into which the matrix may be driven to form a bolster or ridge on the mold, which ridge in turn forms a recess in the stereotype cast, along the sides and ends of the plate, thus obviating the necessity of chiseling or trimming away the metal which would otherwise appear so close to the column as to blacken in printing.

In book and job work, where the type is locked up in ordinary low chases, the type-high bearers with which it is necessary to surround the type should also be beveled.

When the form has been made ready for the molder it should be carefully examined to see that all leads, quadrats and rules are down and that the face of the form is clean. If type or cuts are dirty they should be cleaned with benzine, and the form planed or smoothed



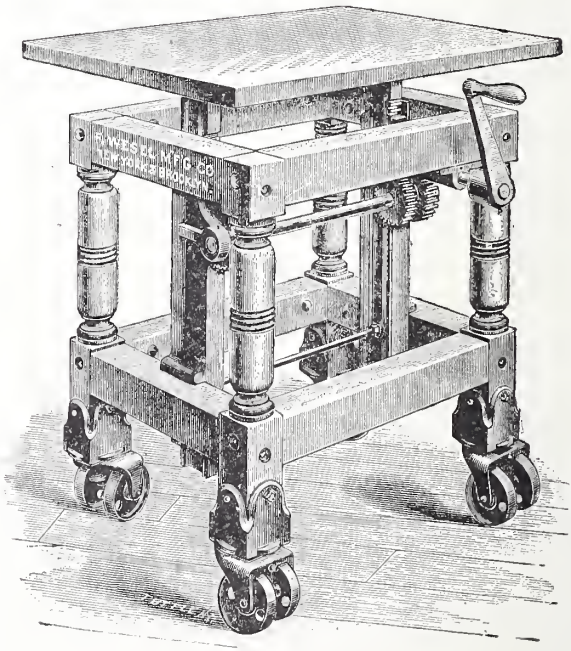
Oil or Chalk Brush.

down and brushed lightly with oil to prevent the flong from adhering to it. The oil employed for this purpose should be free from dirt and sticky ingredients. What is called headlight oil is best, as it is thin and clean and but very little is required to accomplish the desired object. A heavy oil will cause the types to stick together, making unnecessary annoyance and trouble for the compositor in distributing. The brush used for oiling the form is a soft goat's hair, about 4 inches long

by 2½ inches wide. In order that the oil may be evenly distributed, a few drops are poured on a tin plate, from which it is taken up by the brush and applied to the type without depositing an undue quantity in any one spot.

CAUSE OF "HIGH TYPE."

Type-metal, like most other metals, is subject to expansion by heat, and in this fact is found the principal disadvantage of papier-maché stereotyping, for unless suitable precautions are taken to prevent it, the



Beating Table.

expansion is likely to be uneven and the type may therefore be seriously injured or even ruined. When a form of type is locked tightly in a solid iron chase and subjected to the heat of the drying press it immediately begins to expand. The chase being of a different and harder metal does not expand to the same extent as the type, and the latter being rigidly confined by the chase is subjected to an enormous squeeze which results in "high type." In other words, the expansion of the type in a lateral direction being prevented by the confinement of the chase, it is forced to expand in a vertical direction, and as the softer types are most affected by the heat the page soon becomes uneven and eventually is ruined. If, however, type is allowed to expand without restriction in both directions, it will contract in cooling to its original dimensions and the injury resulting from continual heating and cooling will be limited to a gradual destruction of the "life" of the metal, which results finally in brittle or "rotten" type. But this injury is so gradual and the type so evenly affected that it is of comparatively little consequence. The problem is to provide a means of locking the form in such a manner that it shall not be so rigidly confined as to prevent normal or natural expansion.

DEVICES TO ALLOW EXPANSION OF TYPE.

With this object in view, a device has been patented by a St. Louis pressman which consists of side and foot sticks provided with springs, which respond to the pressure of the expanding type, thus relieving it to some extent from the squeeze incident to confinement in a rigid chase. This device is said to have given satis-

factory results, but there is a simpler and less expensive plan for accomplishing the same object. This method has been employed by the author for a great many years and its success may be judged from the fact that a dress of type which has been in use for over a year, during which time it has been subjected to the heat of the steam tables from eight to twelve times a day with a steam pressure of eighty pounds (about 312° F.), contains no high letters. The plan pursued is very simple and consists in placing a strip of pine wood one-fourth of an inch thick between the side sticks and the chase and between the foot stick and the type, for the purpose of providing an elastic medium to receive the pressure of the expanding type.

LOCKING FORMS TOO TIGHT.

As a further precaution, great care should be observed not to lock tighter than is absolutely necessary. This latter point is one which should always be strictly observed. The power exerted by the finely threaded screws upon the wedge-shaped side sticks is enormous, and it is safe to say that in a large majority of cases newspaper forms are locked too tight.

IMPORTANCE OF DRYING BEFORE MOLDING.

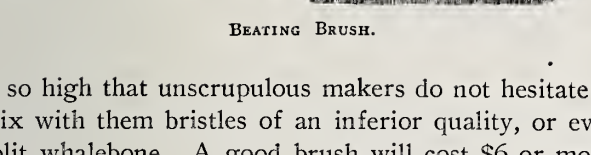
It is customary for newspaper stereotypers to slide the forms onto the steam table, unlock them, plane them down and partially dry the water out of them before molding them. Unless this is done all the water in the type must go through the flong before the latter begins to dry, which not only delays the drying, but often causes the matrix to blister on the spaces.

UNLOCK AND PLANE ALL FORMS.

When forms contain so little water that they do not require to be thus dried, they should nevertheless be unlocked by the stereotyper, carefully planed down, and then relocked with just sufficient pressure to "lift." As a still further precaution it is advisable to slightly loosen the screws after the form is in the press. When this is done it is of course necessary to tighten them again before the form is lifted.

BEATING BRUSHES.

Beating brushes should be made of extra long Russian bristles, set securely in a heavy hard wood back. The best quality is the cheapest, and great care should be observed in selecting them. The cost of the bristles



Beating Brush.

is so high that unscrupulous makers do not hesitate to mix with them bristles of an inferior quality, or even split whalebone. A good brush will cost $6 or more, but will outlast two cheap brushes and will always perform better work.

MOLDING.

The form having been dried, loosened, planed down and oiled, is ready for molding. A piece of flong somewhat larger than the form is laid, tissue side down, on

the type and carefully and evenly beaten into the type until the proper depth is obtained. Care must be taken to make the blows of the brush even and flat. If the beating is done with one end or one side of the brush there will be great danger of tearing the flong. It usually requires considerable practice to make a good mold, but fairly good results may be obtained by the amateur if reasonable care be exercised. The expert molder judges the depth of the matrix by its color. As the paper is beaten into the form it becomes thin and the type shows dark through it. This color is also a guide to determine the evenness of the impression, for if the matrix is dark in one spot and light in another it is evident that it is of uneven depth. If the molder is not sufficiently experienced to be guided by the color in determining the proper depth of the mold, he may raise a corner of the matrix from the form and examine it, provided the portion so raised be carefully replaced and again beaten lightly with the brush, to avoid the danger of "doubling."

It is much better to strike a large number of light blows with the brush than a less number of heavy blows, for unless the operator is an expert a heavy blow will be liable to split the flong, and moreover, light blows often repeated will drive the flong into the bowls or counters of the types, where depth of impression is most desired, while the heavy blow drives the flong down between the lines of type rather than into the bowls, thereby forming ridges on the face of the matrix which not only give it a rough appearance, but which are apt to become imbedded in the metal cast and torn out, thus injuring or destroying the matrix.

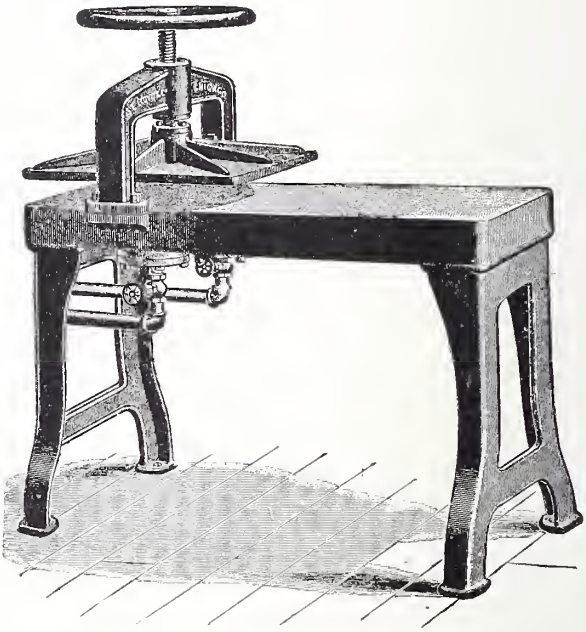
PACKING THE MATRIX.

After the beating is completed the depressions in the back of the matrix which have been formed by beating the flong down into the spaces between the paragraphs or display lines should be "packed" in order to give the matrix sufficient rigidity at these points to withstand the weight of metal in the cast, otherwise the metal when poured upon the face of the matrix would force the spaces back level with the face of the type and it would then become necessary to chisel or rout them down to a depth sufficient to prevent blacking or smutting the printed page. As such chiseling or routing is tedious and laborious work, it is obvious that a little care expended in packing the matrix will save much time and labor in the later operations of finishing; and this is especially true when a number of duplicate casts are taken from the same matrix, for the time required to pack the matrix need be expended but once, whereas, each of the faulty duplicate casts would require to be routed, every defect in the mold appearing, of course, in every cast made from that mold. It is important, therefore, that every precaution be taken by the molder to make the matrix as perfect as possible.

BACKING COMPOUNDS.

The material used for packing the spaces may be pieces of old matrices, strawboard or felt, a putty made of marble dust and paste or, better than these, a compound in the form of powder, which may be readily spread over the matrix. These backing compounds may be procured of dealers in stereotypers' supplies, or

may be manufactured by the workmen. The ingredients employed are usually lime and flour, intimately mixed and sifted, which, when moistened by the steam arising from the form and matrix, and the subsequent



Steam Drying Press.

drying, become a cement hard as stone. As few stereotypers have the necessary facilities for mixing the materials properly, it is usually cheaper and much more convenient and satisfactory to purchase the prepared compound.

When pieces of matrix or strawboard are employed for packing they should be cut into pieces somewhat smaller than the spaces they are designed to fill, in order that the ridges or raised places formed by them on the face of the matrix shall not be too sharply defined, thereby offering an opportunity for the metal to become attached to the matrix.

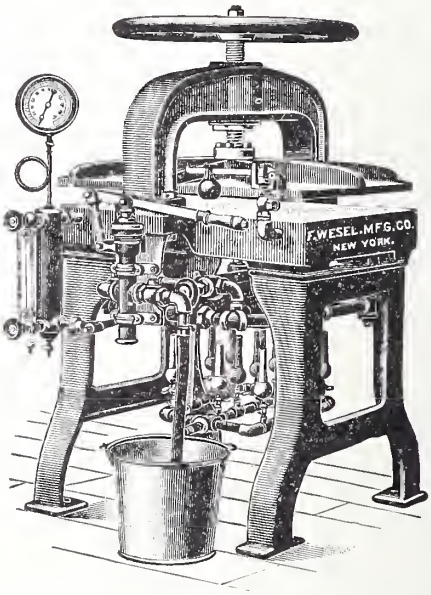
When the powdered packing compound is employed a quantity somewhat larger than is required to do the work is poured on the matrix, and with a straight edge of rubber, wood or strawboard, it is spread back and forth over the matrix until all the depressions are evenly filled. The superfluous powder is then scraped and blown off and a dampened and pasted sheet of backing paper is laid over it, care being taken not to disturb the powder.

The form is now covered with from four to eight thicknesses of soft blankets and placed under the platen of the steam drying press. The pressure of the platen should be sufficient to hold the matrix in perfect contact with the type while it is drying, and also to crowd the matrix down into all the spaces; or, in other words, keep the matrix stretched, thereby preventing wrinkling, but excessive pressure should be avoided, particularly on small forms. When the blankets are new the press should be tightened several times during the drying process, as they will pack much tighter after having absorbed water.

DRYING THE MATRIX.

The time required to dry the matrix depends upon the nature of the form and the dryness of the steam

furnished to the press. A form which is reasonably free from water and contains no wood-backed cuts should dry in six or seven minutes, with sixty or eighty pounds of steam pressure (293° to 312° F.). Wood-backed cuts retard the drying materially, as the heat from the press must pass through the wood before it can affect the matrix, and as wood is a nonconductor



STEAM DRYING PRESS WITH GAS-HEATED STEAM GENERATOR.

of heat it naturally follows that a long time is required to heat the matrix sufficiently to thoroughly dry it. It is poor policy to place such cuts in forms which are to be stereotyped, for the work is not only delayed thereby,

but the type in the same forms is subjected to the heat of the press for a much longer time than would otherwise be necessary. The steam table, or steam press, is a closed iron box, oblong in shape and mounted on legs of a sufficient height to bring the upper surface of the table on a level with the beating table. The upper surface of the press is machined perfectly flat and smooth, and extending over half its length is an iron platen which is raised and lowered by a screw passing through a yoke which is bolted to the sides of the table. To the upper end of the screw a large hand wheel is keyed, by means of which a sufficient pressure may be exerted on the platen to crowd the soft blankets with which the form is covered into all the depressions of the matrix, making the spaces or raised portions smooth and rounded and holding the matrix in rigid contact with the type, thereby preventing its natural tendency to shrink in drying.

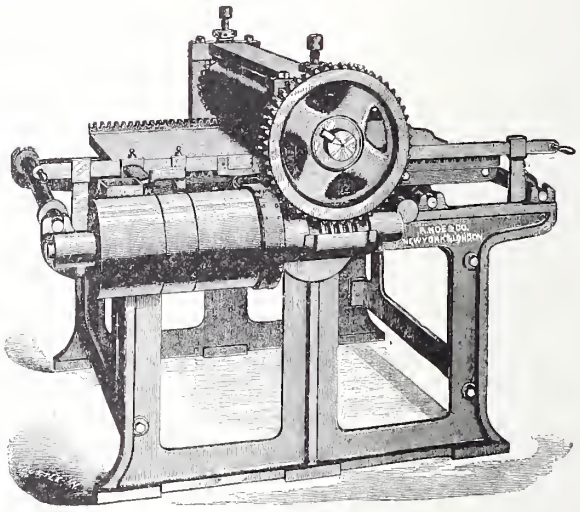
BLANKETS.

The blankets used for this purpose should be neither too coarse nor too fine. If too coarse the impress of the web on the matrix will appear on the reverse side, distorting or destroying the accuracy of the reproduction. Moreover, such blankets are not sufficiently absorbent to hold the moisture evaporated from the form. A thick, soft, medium-priced blanket is most economical and satisfactory. When such blankets become hardened by use they may be washed, dried and used over again several times before they will lose their elastic and absorbent qualities.

Blankets specially designed for this purpose may

now be purchased of manufacturers and dealers. They somewhat resemble printing-press impression blankets, but are thicker and coarser. The blankets should be thick enough to absorb all the moisture from the form and matrix as it is released, in the form of steam, by the heat of the steam press.

When the matrix has been thoroughly dried the pressure of the platen is released and the form with-



Rolling Machine.

drawn from the steam press. The matrix is now carefully removed from the type, the edges trimmed with a pair of shears, taking care to leave sufficient margin to go under the gages of the casting box to prevent the metal from flowing behind the matrix.

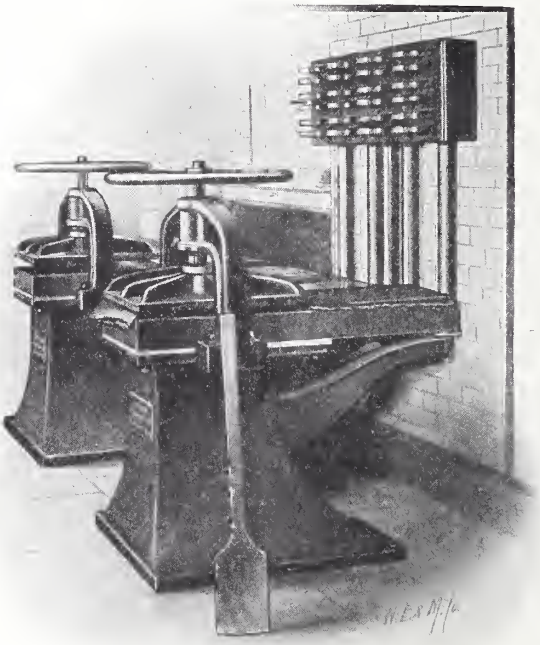
HADAWAY ELECTRIC MATRIX DRIER.

The Westinghouse Electric & Manufacturing Company are the selling agents for this device, and make the following statement:

"In the modern newspaper office time is of great importance, particularly in the production of the frequent editions of the afternoon papers. These papers find it necessary to get out editions at close intervals and unexpected events are liable to entail sudden and radical changes in the make-up. Each change in the make-up of a page requires a stereotype matrix from which the plates for the presses are cast. The sporting edition, in particular, is a source of daily trial and worry. The prestige of being first on the street with the complete record of the sporting events of the day is an asset of value, and each paper strains every nerve in this race against time. In the morning paper office the work is scheduled so that the paper can be distributed in time to meet the workers on their way to their daily tasks. Transportation conditions, the weather, etc., must all be taken into account, and the forms must be held open until the last minute. A specially desirable story arriving at the last minute is liable to shatter the regular routine, and then the time of going to press is held back to the last minute.

"Owing to this daily race with time the newspaper offices are the most progressive in the world. The pressroom and the composing-room have been speeded up by the use of the most modern machinery. The casting of the stereotype plates is done by an automatic machine that finishes them ready for the press. The making of the matrix for these plates has remained

the longest step in the process, owing to the time required to dry out the matrix. This takes several minutes.



Hadaway Electric Matrix Drier.

"Steam and gas heated matrix driers have been, heretofore, the only matrix driers which successfully withstood the service in newspaper offices. A number of attempts have been made to increase the speed at which matrices could be dried out, including attempts

to apply electric heat to the process. Owing to the localization of the heating element so as to transmit the heat directly to the type and matrix, it was evident that this method would be more rapid than any other. A number of efforts were made to perfect the electrically heated matrix drier, but it was not until three years ago that this method was demonstrated to be a commercial success.

"In order to understand the difficulties to be overcome, it is necessary to consider that the matrix should be completely dried in from three to five minutes. This requires an excessively high working temperature. When the attempt was made to work with the high temperatures on a steam or gas heated matrix drier, the type or slugs were damaged. The beds of these presses were made as thin as practicable in order to transmit the heat rapidly. This made it necessary to raise them to an exceedingly high temperature so that they would be able to heat the type rapidly. In practice it was found that in order to cut down the time of drying the matrix, these beds had to be heated to a temperature that caused serious damage to the type. Mr. W. S. Hadaway, of the Hadaway Electric Heating & Engineering Company, New York city, has made a close study of this matter, and in 1905 this company placed its first installation of electrically heated matrix driers in the Government Printing Office, Washington. Since then several very successful installations have been made, and the time for thoroughly drying a matrix has been reduced to less than three minutes in an installation of matrix driers at the plant of the *Philadelphia Bulletin*. This record

is made by a Hadaway heater. These driers are equipped with safeguards to prevent their overheating, and in spite of their high working temperature cause no damage to the Linotype slugs. The ability to maintain a high working temperature in the Hadaway matrix drier arises from the heavy cast-iron bedplate in which the heating element is hermetically sealed. This bed acts as a thermal storage reservoir and its upper surface is maintained at a very high heat by the heating element embedded just below this surface. The comparatively cool form rapidly absorbs this surface heat and is quickly raised to a temperature sufficient to thoroughly dry out the matrix in a trifle less than three minutes, or in from one-third to one-half the time required by steam or gas heated matrix driers."

THE MOLDING MACHINE.

The Rolling Machine or Molding Machine was invented by James Delegana in 1861. It consists of two heavy cast-iron cylinders, mounted in a suitable frame, one above the other. The ends of the upper roll are provided with gear wheels which engage the racks of a bed traveling between the rolls. The shaft of the upper roll extends beyond the frame of the machine and terminates in a worm wheel which is driven by a worm supported by brackets attached to the side frame. By means of tight and loose pulleys on the worm shaft, and suitable mechanism for shifting the belts, the roll may be made to revolve in either direction, thus moving the bed forward or back at the will of the operator. The purpose of the machine is to utilize steam power to perform the laborious work of molding. In opera-

tion the form is slid onto the bed of the machine and there made ready for molding in the usual manner. The flong is laid on and covered with a thick felt blanket, and the form passed through the rolls and back again. The depressions in the matrix are then packed and the form dried in the usual manner.

EFFICIENCY OF MACHINE MOLDS.

The difficulty with machine molds seems always to have been either lack of depth, particularly in the bowls of the type, or lack of sharpness of impression. It was found that the flong as ordinarily made for the brush process were not suitable for the machine because there was so much water in the paste and paper that it was forced through the flong by the pressure of the roller, making the surface of the matrix rough and uneven; and, to add to the vexation, the paste soaked into the paper, making the flong hard and difficult to impress. To overcome these difficulties various compositions have been tried, one of which has for one of its ingredients an acid which acts on the paper as a solvent, reducing it to a semi-pulpous condition. In this state the flong is easily impressed, but the depth so gained is largely at the expense of sharpness of impression, due to the paper being reduced by the solvent to a mushy condition. A better method of obtaining the necessary depth, and one which will not destroy or change the nature of the paper, may be found in the use of a paste which, instead of soaking into the paper, will form a coating on its surface, thereby giving to the flong a somewhat waxlike quality which insures a sufficient depth of impression without subjecting the type to

injurious pressure from the roller. There are various recipes for a paste which would fill the requirements noted, but the essential feature of all is the employment of as large a proportion as possible of a mineral or chalk ingredient. A composition which will be found in every way satisfactory is described in Chapter II. This paste may be used with ordinary matrix paper, but is best adapted to use in connection with a softer quality of paper, such as is made especially for the purpose by several paper mills in this country.

The impression blanket used on the machine should be of extra heavy felt, and to insure good work must be kept dry. It is advisable, therefore, to have on hand a sufficient number of blankets so that it may not be necessary to use one a second time before it has been dried. An extra heavy press blanket may be made to answer for the machine work, but it is better to use the special blankets which are now made for the purpose, as they are nearly or quite double the thickness of a press blanket, and therefore admit of a deeper impression and are a better protection to the type.

An improved Rolling Machine, invented about 1890, has a device for quickly adjusting the impression of the roller so that the pressure may be increased, if desired, between the reciprocations of the bed plate. This machine is designed for the production of an extra deep matrix such as is required for the production of flat stereotype plates which are worked on presses carrying soft impression blankets, and which, if shallow, would be apt to smut the paper.

The improved machine differs from the ordinary machine in the important respect that the journal bear-

ings of the upper cylinder rest upon spiral springs of sufficient strength to raise the cylinder vertically away from the bed plate, except when held down by screws which impinge against the upper surface of the bearings. These screws are provided with lever handles which are connected by a cross piece pivoted to them, so that the workman, by moving the cross piece to the right or left, operates the screws over the bearings of both ends of the cylinder simultaneously, and thereby depresses or raises the cylinder at will.

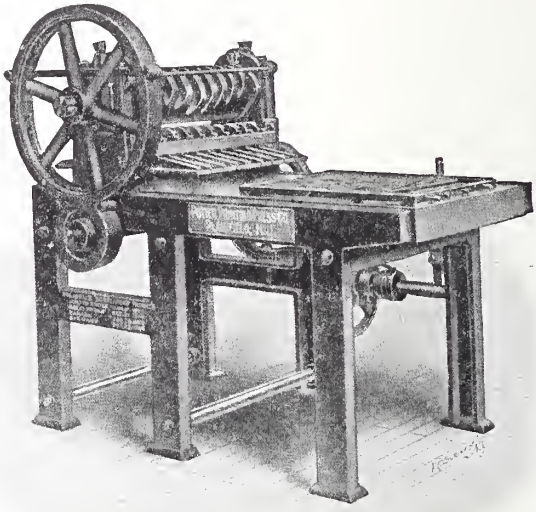
In operation, the form is passed under the roller in the usual manner; the cross piece is then moved a few inches to the left, thus lowering the cylinder slightly, and the form returned under the roller; then if a still greater depth is desired, the cross piece is moved several inches to the right, the back laid on the matrix, and the form again passed under the roller, and, before it is returned, the cylinder is once more depressed. In this manner four distinct squeezes are given to the matrix, thus producing a depth which it would be impossible to obtain with a single impression, and assuring the additional advantage of producing perfect adhesion between the matrix and the back. It is also found that matrices made in this way require no packing except in large places, as the different impressions crowd the flong effectually into the depressions of the form and give to the spaces a curve and consequently a strength sufficient to resist the weight of the metal.

THE SCHREINER MOLDING AND DRYING MACHINE.

A more recent invention along this line is called a rapid matrix maker, but perhaps a more accurate name

would be a rapid matrix molding and drying machine, as it takes the flong at the time when it is ready to be beaten or rolled into the form.

The device consists of a steam-heated bed like that of an ordinary steam table, upon which is mounted a



Schreiner Matrix-making Machine.

cylinder bearing upon its face a series of cones, which operate upon a corresponding series of bars which form what may be termed a sectional platen.

The form upon which a flong has been placed, on which suitable blankets are laid, is placed under the sectional platen, the power is then applied which causes the cylinder to revolve and brings the central cam,

which is longer than the others, into contact with an anti-friction roller on top of the central section of the platen and forces it down on to the blanket and impresses the flong into the form.

This in turn is followed by similar action by the other cams upon each side of the center, until the pressure is evenly applied to all the sections covering the form. The power is then automatically stopped and the pressure allowed to continue until the flong or matrix is thoroughly dried. This takes from two to three minutes, which is a great saving over the average time of molding and drying the matrix.

With this machine one handling of the form covers the whole operation, in place of the double one of molding and then placing the form under pressure on the steam table to dry. It is also said that there is no possibility of a "double impression," or of rolling the type off its feet as sometimes happens in the prevailing method of molding, as the pressure is directly down into the form and constant, not being released until the matrix is dry.

EXPERTS REQUIRED FOR ROLLING MACHINES.

The operation of the rolling machine should never be intrusted to a novice, for, although type can be molded without injury if the machine is properly and carefully handled, in the hands of a careless or inexperienced workman great damage may be done by subjecting it to unnecessary pressure. This occurs when an attempt is made to obtain a deep impression in a flong too hard for the purpose.

CHAPTER IV.

COLD PROCESS STEREOTYPING.

THE problem of drying a matrix without heating the type is one which has received the attention of publishers and stereotypers ever since the papier-maché process of stereotyping was first applied to newspaper work.

The object of such a process would be twofold — first, to avoid the danger of injuring the type by overheating, and, second, to save time in drying. By the steam press method of drying the type must first be heated before the matrix can be dried. A large proportion of the time required for drying is consumed in this way. If a process could be devised whereby the matrix could be dried without thus heating the type, it is obvious that several minutes could be saved which would be of immense value to metropolitan publishers.

That the desirability of such a method of drying has been appreciated by those interested is shown by the fact that many thousands of dollars have been expended in experiments having this object in view.

It is obviously a difficult matter to dry wet paper without shrinking it, and recognizing this fact many efforts have been made to mold in dry paper. The essential feature of dry stereotyping paper is the porosity which is produced in the pulp by chemical actions. This dry flong is supplied by the makers ready

for use, and the results obtained are fairly satisfactory for ordinary letterpress work. The dry process is not suitable, however, for the reproduction of half-tone engraving or fine work of any description. The matrix is made by laying a sheet of the dry flong on the form, covering it with a piece of felt press blanket and running it through the rolling machine.

The matrix thus made may be placed at once in the casting box. No further drying is required. It is therefore the quickest known method of stereotyping, and for this reason is popular for certain kinds of work.

Another cold process, which produces very creditable results, is the invention of Henry Kahrs, New York. By this method the flong is faced with a composition which does not shrink in drying and which insures a perfectly smooth printing surface. The matrix is composed of one sheet of special matrix paper and two sheets of common news paper, all three coated with the composition. The composition is furnished by the inventor in the form of fine powder and is prepared for use by mixing with water. If preferred, the matrix sheets may be purchased already coated, in which case they require to be dampened slightly to prepare them for use. The matrix is dried by laying it, face up, on a warm iron table or other flat heated surface.

Another cold process is the invention of Friedrich Schreiner, and, like the Kahrs process, its essential feature is the coating of the matrix paper. The sheets already prepared may be purchased from the inventor.

THE NIKELLO PROCESS.

The Nikello process consists in first making the matrix in such a manner that it will withstand greater heat and thereby admit of the use of a harder and more dense metal than is usually possible. By combining these features there is produced a sharper and smoother cast.

One of the most advantageous points about this process is found in the fact that practically any number of casts can be taken from the same matrix. This number is only limited by a remote possibility of the matrix face becoming cracked by careless handling or accident.

In all previous attempts at stereotyping fine half-tone screen work, as a rule, but one cast could be made from a matrix, and in many cases this was not a success because the heat of the metal destroyed the fine dot replicas formed on the face of the flong, and in the use of plaster processes the mold is broken when it is removed from the cast.

The novelty of this particular flong consists in applying a pasty composition to the usual paper surface and allowing it to set slightly, when it is pressed directly on to the face of an oiled block or form. As there is absolutely no intermediary substance between the face of the type or relief surface of the engraving and the composition, an unusually bright surface is secured in the finished matrix. The surface of the walls of the molded impression when dry are said to be as smooth and hard as porcelain, at the same time retaining the flexibility of the usual flong.

The composition does not contain anything gran-

ular, so that the letter or other faces must be exact replicas of the originals; it can be applied to the surface of the flong or prepared in the ordinary way according to the custom of the stereotyper, or if the time necessary to prepare layers of tissue is to be eliminated the composition can be applied to special backing paper.

In whatever way it is prepared the flong will keep in serviceable condition for several days, because the paste is treated with a special preservative. The powder from which the paste is made is put up in air-tight cans, so will be free from deterioration indefinitely.

The flong may be beaten in with a brush as usual, but it is recommended by the makers to use a rolling press. It is claimed that the depth secured is practically the same as in electrotypes. The matrix is dried from either the face or back of the type, but in the former case the drying is much slower, a gain being found in the possibility of leaving cuts on their original bases. An ordinary fire, gas or steam chamber may be used. The casting process is exactly similar to ordinary procedure.

NICKEL-FACING.

Other features of this process are found in the special treatment of the cast face of the stereotype, electrolytically, so as to coat the printing surfaces with a thin nickel coating that protects the face from wear because of the hardness of the nickel. Of course, casts can be printed from direct, as is usually done, but the nickel facing produces a smoother and denser printing surface which will take ink from the printing rollers

more uniformly than plain stereos, thus avoiding the gray effect in the print so frequently present when nickel-coated stereos are not used.

There is not the complexity in electrically coating the cast with nickel as would ordinarily be imagined. The electric current may be supplied by a battery or small dynamo; the whole time consumed is but from ten to fifteen minutes, and more than one plate can be done at a single operation. There is little or no attention required, as the nickel anodes, after the bath is once started, will automatically replenish the solution. The hardness of nickel is so well understood that no specific reference to this quality need be made.

It is in the field of half-tone reproduction that this process is specially adapted because of the faithfulness of the nickello method of molding and the wearing qualities of the cast. Ordinary stereos may stand up to 25,000 impressions, but a nickeled stereo will be available for ten times this number of impressions, and as the matrix is good for many re-casts, duplicates can be produced quickly and cheaply for further use on the same press or to supply forms for other presses running on the same edition.

CHAPTER V.

CASTING.

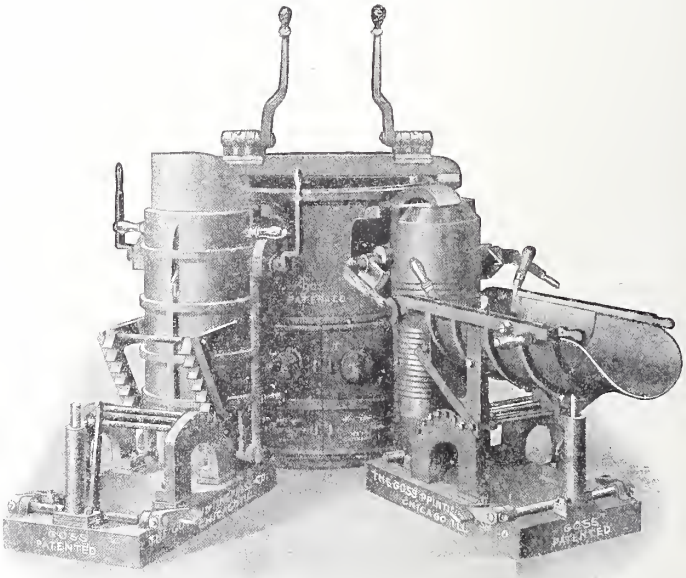
STEREOTYPE furnaces may be round or square; the former are made of boiler iron and the latter of cast iron, and in both cases are lined with fire brick, and furnished with grates, fire box and ash pit. They are set on iron legs or feet, so as to leave an air space under them, and the floor, if wood, is protected from the heat by a sheet-iron covering. All metal furnaces should be furnished with a sheet-iron bonnet, connected with the chimney flue, to provide a means of escape for the smoke and poisonous gases. The bonnet is shaped like an inverted cone, with the tip cut off to allow the smoke to escape into the pipe above. One section of the pipe is riveted to the cone and made smaller than the section into which it telescopes, thus permitting the bonnet to be raised and lowered at will. On opposite sides of the bonnet ears are riveted, to which small wire cables are attached. These cables run over pulleys in the ceiling and are secured to counterbalance weights which hold the bonnet suspended at any desired distance above the pot. The bonnet is provided with a door through which the metal may be stirred and skimmed.

Stereotype furnaces are made of various sizes, their capacity ranging from 100 to 10,000 pounds of metal.

On page 57 is illustrated a furnace of the size most

commonly used by the larger foundries. It will hold about 2,000 pounds of metal.

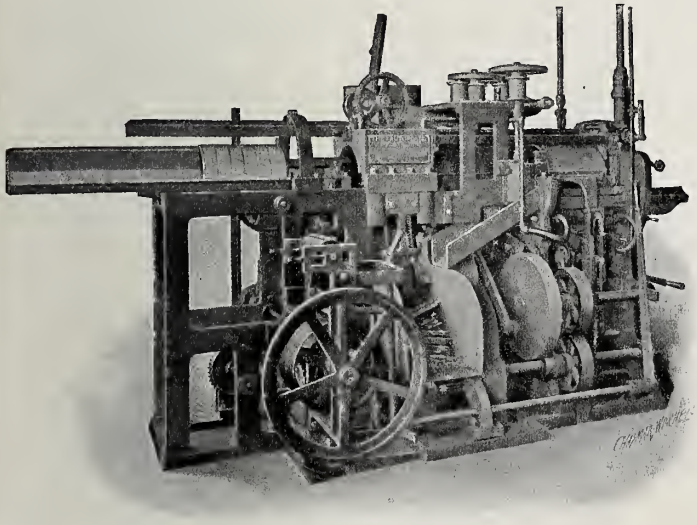
A furnace of new design is illustrated herewith, which has been adopted by many of the larger newspapers. The kettle will hold several tons of metal, and



Pump Furnace.

is equipped with a device by means of which the metal is pumped into the casting boxes, thus doing away with the laborious work of pouring the metal with ladles. The furnace is also equipped with a thermometer which indicates the proper heat for casting, and eliminates all guesswork.

A few of the large newspaper offices are equipped with automatic machines, which not only cast the plates, but shave, trim and deliver them ready for the press at the rate of three to four per minute. This machine is called the Autoplate, and is the climax of



AUTOPLATE.

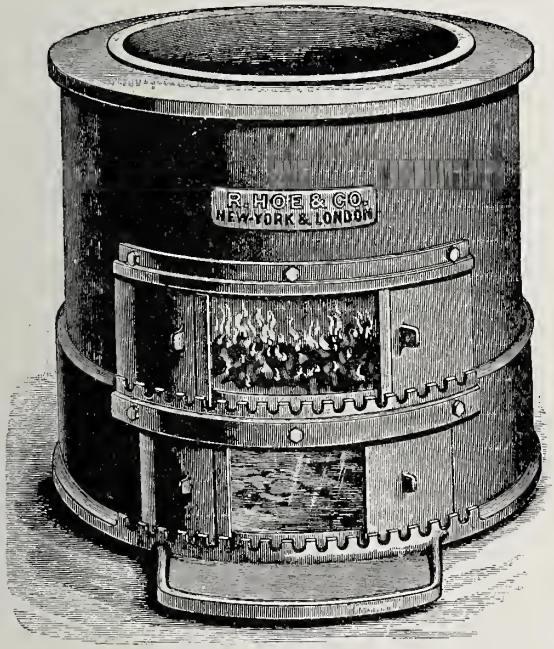
labor-saving mechanism for plate-making. At one end of the machine is the casting mechanism in which the matrix is secured (the operation of securing the matrix occupies less time and may be done with more convenience than with the present hand-manipulated casting box). Once the matrix is in position the operator at the casting end of the machine throws down a control lever and the casting apparatus proceeds to auto-

matically cast and deliver plates to the finishing mechanism which is structurally joined to it. As each cast is ejected from the casting chamber it is automatically moved into the finishing device, where, likewise automatically, it is trimmed, head, foot and sides, passed out, its bevels finished and delivered ready for printing. If large blanks throughout the body of the matrix are not properly packed they will have to be dressed out by hand, but all other finishing the machine takes care of. The autoplate is so arranged that a change may be made from one matrix to another with the loss of but one casting operation; thus it is easy (and results in the loss of but the fraction of a minute) to change from the casting of one page to that of another. It should be understood that the change of matrices, which requires the stoppage of casting, in no wise interferes with the operation of finishing all the plates that are in the machine at the time of the change. From three to four men are necessary to attend the machine; one to look after the casting operation, another to look after the supply of metal and the third or fourth to inspect the plates as they are delivered and lift them off the machine.

COMPOSITION OF STEREOTYPE METAL.

Stereotype metal is an alloy of tin, lead and antimony, the proportions of each varying in different grades. Metal which is used over and over again, as it is in newspaper foundries, must be made of the purest ingredients, and should contain a larger proportion of tin than an alloy which is to be cast but once, or which goes out to the country publishers in the form of news

plates and comes back to be melted over but once in a month or six weeks. For newspaper work the proportions are about as follows: Lead 75 pounds, antimony



Melting Pot.

17 pounds, tin 7 pounds. For book work, lead 80 pounds, antimony 15 pounds, tin 5 pounds. For country plate work, lead 85 pounds, antimony 12 pounds, tin 3 pounds. These formulas are not exact, for no two makers use exactly the same rule, but they

are approximately so. The antimony is added to the lead to give hardness to the metal and to reduce contraction when cooling, and the tin acts as a flux. Some stereotypers buy the materials and mix their own metal, but it can always be bought of reputable dealers, ready mixed, cheaper than the materials can be purchased separately in small quantities. If, however, the workman should be obliged to mix his own metal, the antimony should be melted first, as it is the hardest of the three metals and a high temperature is required to fuse it. The lead should be added next and the tin last. By observing this order the temperature may be immediately reduced after the antimony is fused, whereas, if the lead were treated first the heat of the furnace would have to be continued until the antimony were melted, during which time the waste of lead by oxidation would be considerable. The temperature necessary to melt these metals is as follows: For antimony, 842 degrees; for lead, 612 degrees; for tin, 442 degrees. Stereotypes may be cast from metal made of old materials, such as old type, lead pipe, tea-case lead, etc., but the product is not always satisfactory, though it may be made to answer in some cases. Type metal contains larger proportions of antimony and tin than stereotype metal, and requires, therefore, an addition of lead to make it suitable for stereotyping. As type founders do not all use the same formula in mixing their metals, the amount of lead which should be added can not be definitely stated, but will average about fifty pounds to one hundred pounds of type. In mixing old metals care must be taken to throw out every scrap of zinc, a small piece of which would ruin

a large quantity of what would otherwise be good metal.

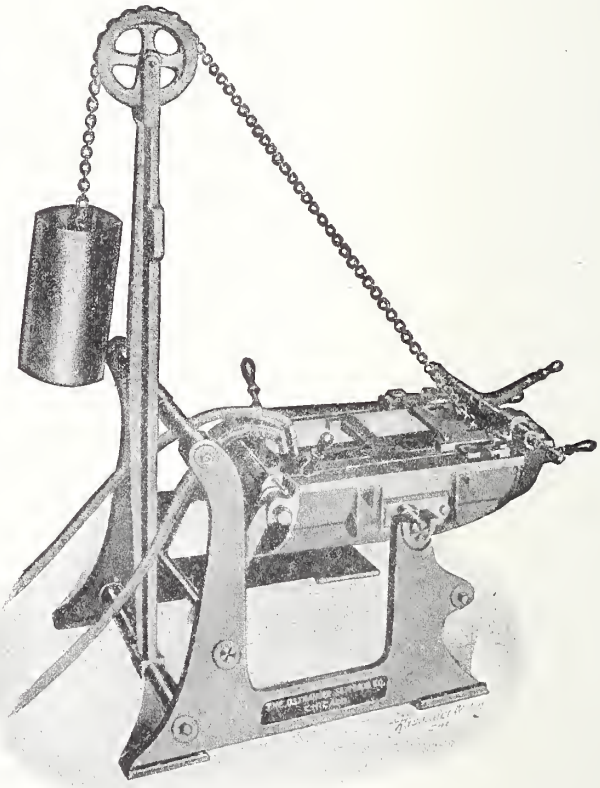
Metals, whether new or old, should be mixed in a pot covered by a sheet-iron canopy, or bonnet, which is connected with a chimney flue, as the vapors arising from them are injurious to health.

CASTING BOXES.

Casting boxes are formed by two cast-iron plates, hinged together at one end or side, and separated from each other by thin strips of steel, called gages, whose thickness determines the thickness of the stereotype. In operation, the matrix is laid on the lower plate and surrounded on three sides by the gages which rest upon the side margins and one end margin of the matrix. The upper plate or cover is then closed down upon the gages and clamped fast to the lower plate, thus forming a box, with one end open to receive the molten metal. It is essential that the box shall be several inches longer than the desired stereotype, in order that space may be provided for the impurities and air bubbles which will rise to the top when the metal is poured. To prevent the metal from running behind the matrix, which is much shorter than the box, a paper or sheet iron extension, called the tail-piece, is laid under the gages upon the upper margin of the matrix.

Casting boxes in which full page plates for rotary presses are cast, are semi-cylindrical in form, the lower plate being concave and the cover convex; the curves corresponding exactly to the plate cylinder of the press. Curved stereotype plates are locked upon the press cylinders by clamps operating against the ends of the

plates. That the lock may be absolutely secure, the plate ends and clamps are beveled, the latter overlapping the former and holding it firmly in position. The angle on the plate is produced at one end by the machinery which cuts off the jet or tail, and at the other



Curved Casting Box.

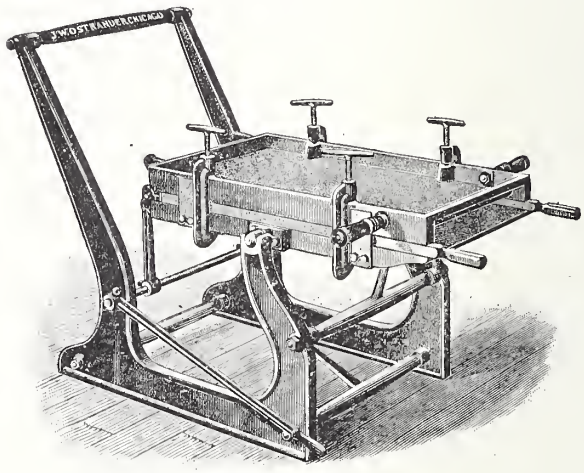
end by the end gage of the casting box, which is beveled on its under side to form a recess into which the metal flows, thereby producing a corresponding angle on that end of the plate.

The convex cover of the box is grooved at regular intervals, in the direction of its curve, and the metal, flowing into these grooves, forms ribs on the back of the plate. In finishing the plate to the exact thickness required these ribs only are shaved. This saves metal and work in finishing.

The ordinary curved casting box is supported in an iron frame on trunnions which are located near the center of greatest weight, and by the tripping of a dog, which is operated by a hand lever, may be easily and rapidly swung from a horizontal to a perpendicular position and *vice versa*. These casting boxes used in the larger newspaper offices are necessarily very heavy, and to assist the workmen in handling them a counterbalance weight is sometimes attached by means of a cable or chain and grooved pulley to the cover. In another form of curved casting box the cover is not hinged to the box, but remains rigid in a perpendicular position. The object of the invention is to form a casting box that can be easily and quickly opened and closed, and that will move away parallel, or nearly so, when the parts are set in motion, thereby readily separating the concave side of the stereotype plate from the core block.

The machine is made with a suitable frame for supporting the core block, and a movable casting box. The core block stands nearly vertical and is stationary. The casting box rests upon trunnions connected by

standard-moving carriages having slideways upon the frame. The carriages are moved back and forth by links and crank pins to disks upon a shaft which is operated by a lever and pawls and a ratchet-wheel upon



Flat Casting Box.

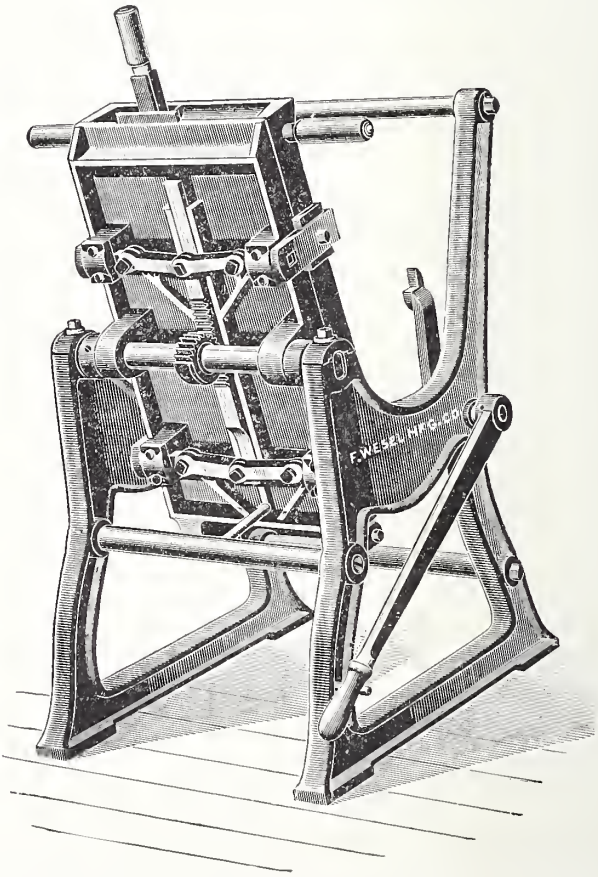
the shaft. The casting box is held by a catch and drawn forward in an almost perpendicular position in contact with the semi-cylindrical core block, there being a space necessary for receiving the melted metal which is cast to form the stereotype plate. When the plate is to be removed the casting box is forced back from the core block, carrying with it the stereotype. It is then tipped into a horizontal position and supported by a rest, while the stereotype is being removed or the matrix secured in position.

SPEED IN STEREOTYPING.

In newspaper stereotyping speed is one of the greatest requisites, and where a large number of plates are required two or more boxes are provided in order that one cast may be poured while another is cooling. To still further facilitate the work the covers of the boxes are made with a concave recess on their upper surfaces and into the receptacles thus formed water is poured occasionally to cool the cover, which otherwise would, after a few casts, become extremely hot, thereby seriously retarding the setting of the cast. When the cover is swung up to remove the cast the water runs from the lower end into an iron pan provided for the purpose. In the box previously described where the cover remains stationary the top is covered, forming a closed basin, and through this a spray of water is kept running by means of pipe connections with the usual water supply and sewer.

Casting boxes for casting flat newspaper plates differ from those just described. The box and cover are flat instead of semi-cylindrical, and the size and shape of the rib grooves in the cover which form the legs on the back of the plate are not the same. Most newspaper plates are cast thin; from one to two picas, 1-6 to 1-3 inch (.1666 to .333 inch) in thickness, the additional height required being obtained by mounting them on blocks or bases. This is accomplished in a variety of ways, but usually by interlocking one of the legs of the plate with the upper surface of the base, either directly, or by means of a device that will quickly lock the plate and base together in the chase and yet at the same time permit them to be readily sepa-

rated. In either case one or more of the legs of the plate must be dovetailed or recessed by special machinery. It is obvious, therefore, that the disposition of the



5-Column Box, Shut, Showing Automatic Clamping Arrangement.

grooves in the cover of the casting box which form the legs of the cast plate must correspond as nearly as may be to the requirements of the lock-up.

Plates which are secured by means of a bevel or rabbet cut on the sides or ends are usually formed with legs to facilitate shaving, but in this case the legs do not require to be located with the same exactness as with the former.

Casting boxes for book or job work where the plates are to be mounted on wood are made without grooves in the cover and with gages one pica in thickness. The cover of the job box, if small, is usually secured, when closed, by a single clamp consisting of a screw operated by a hand wheel and mounted in a swinging arm which is pivoted at one end to the side frame of the casting box. Casting boxes more than ten or twelve inches in width, however, should be clamped at each corner to prevent the cover from springing. This is usually accomplished by swinging clamps pivoted to the under side of the box and provided with T-head hand screws in the upper or projecting ends.

Another form of casting box is employed for both job and newspaper work when a type-high cast (.918 inch) is required. In this box cores or raised projections are riveted to the box or are machined out of the solid iron for the purpose of economizing as much as possible in the weight of the cast. The metal running between the cores forms the legs of the finished plate. These boxes are made to cast any number of columns, from one to six, or more, and are a great convenience to publishers who have not the facilities for mounting thin or separable plates.

On page 64 is illustrated an improved casting box which consists in an automatic clamping device by means of which the workman is relieved of all responsibility in this direction and the time consumed in operating the usual hand clamps is entirely saved.

There are various other forms of casting boxes designed for special work, but as they are all modifications of those already mentioned, it will be unnecessary to describe them here.

CAUSES OF FAILURE.

Casting stereotype plates is apparently a simple matter, yet the amateur and even the expert will often find difficulties to overcome. The most common trouble is, perhaps, the "shrink," i. e., a depression in the face of the cast, which sometimes appears in one spot, but most often in streaks down the center of the column. This shrinkage is frequently caused by poor metal, but is sometimes due to unequal cooling of the metal. Iron is a good conductor of heat, and once heated is slow to cool. The face of the cast is protected from the hot iron box by the matrix which comes between the cast and the iron box, while the back of the cast is in direct contact with the heated iron cover. The result is that the face of the cast cools more rapidly than the back, and the natural contraction of the cooling metal draws it away from the matrix. It is plain, therefore, that the remedy for this trouble lies in the equal cooling of the cast. In book and job casting this may be easily accomplished by protecting the back of the cast with a sheet of heavy paper. After placing a matrix in the box and the gages in position, a sheet of

paper is laid over the gages and the cover brought down and clamped. The metal is then poured between the paper matrix on the one side and the paper back on the other, and the cooling thus equalized throughout. The paper back may be pasted to the cover of the box, but as it is difficult to make it adhere, and as it sometimes sticks to the metal and tears off in spots, it is usually less troublesome to use a separate sheet each time in the manner described. Smooth heavy manila paper is the best to employ for this purpose because the metal is less liable to adhere to it than to more porous paper. This tendency to stick may be reduced, however, by first brushing the paper with powdered French chalk.

Casting boxes with grooved covers are more difficult to manage, but may be rendered non-conductive to a great extent by painting the cover thoroughly with the following mixture: Equal parts of fine-cut tobacco and lampblack mixed with water and boiled for fifteen or twenty minutes. The casting box is then heated by casting several slugs or blanks and the juice applied with a paint brush. Another slug is then cast and another coat applied, and the process continued until the surface is covered with a thin film. Some time is required to coat a new box, as the paint must be burned on; but, once coated, it requires to be brushed over but once or twice a week. The writer has used this preparation for a great many years and has found it a reliable remedy for "shrinks." The semi-cylindrical boxes first described are not usually coated, as the water thrown into the cover, after each cast, serves to equalize the cooling.

Undue shrinkage in the width or length of the plates is caused by using the metal too hot. Up to a certain limit stereotype metal will expand in proportion to its heat, and in cooling will, of course, show a corresponding contraction. It is obvious, therefore, that the cooler the metal, the less will be the shrinkage. It may be set down as a rule, that the metal should be cast as cool as possible; in other words, no more heat should be applied than is necessary to reduce it to a fluid state.

To produce satisfactory results with cool metal the casting box must be warm but not too hot. Several slugs or blank casts should be made before attempting to cast a plate; otherwise the metal, already on the point of setting, will harden before it reaches the bottom of the box. With the box hot, however, the metal is kept in a fluid state until every indentation of the matrix is filled. The shrinkage of a cast twenty inches in length, with the metal of the proper temperature, should not exceed one-tenth of an inch.

If the matrix blisters in casting it is an indication that the paste was too thin, or not sufficiently adhesive, or that it was not spread on the paper with sufficient care. In making matrices for half-tones it is absolutely essential that the paper shall be thoroughly pasted. If any spots, however small, are left uncovered, the paper will separate and puff up. This sometimes happens when molding forms are made up exclusively of type, but is much more likely on flat surfaces. If the flong is properly made up in the first place, the cause of blistering will be found in the use of undried matrices. If any moisture remains in the matrix it will be changed to steam by the heat of the metal and the layers of

paper forced apart or raised up, "blistered" by the expansion of the steam. The molds should be dried as thoroughly as possible on the type and then laid on a hot surface for some time until the moisture has been entirely expelled.

CASTING CHALK PLATES.

The stereotyper in a newspaper office is frequently called upon to cast "chalk plates." This is a different proposition from casting from papier-maché molds. The metal and the casting box must *both* be very hot, the casting box as hot as the metal. An error is often made in trying to cast with the temperature too low. Shrinks may be avoided by chilling the lower end of the cast first and gradually extending the cooling process to the upper end. This may be done with a sponge or swab soaked in water. The cooling should be done on the side the chalk plate is on. When large type or black cuts come out in the cast concaved or depressed in the center, it may be due to one of several causes. If the concave is in the matrix, it may be caused by hard drying blankets and insufficient squeeze on the drying press, or if a very thin matrix is employed the pressure of the metal in casting will sometimes force down the spaces around the large type or other black surface to an extent sufficient to cause the center of the type mold to spring up slightly, thus forming a depression in the cast. If the matrix is not defective, the depression in the cast is caused by the shrinkage of the metal away from the matrix in cooling. This may be due to one or more of three causes. The metal may be too hot or it may contain too much tin; or the cast-

ing box may be tilted in the wrong direction, i. e., so that the pressure of the metal is against the back cover of the box instead of against the matrix. The casting box should lean a little so that the matrix will rest against the lower half. The tendency will then be for the metal to shrink away from the cover rather than away from the matrix. Honeycombed plates are caused by too much antimony in the metal, and the remedy is to add a smaller amount to the mixture. Spongy plates may be due to the presence of zinc in the metal, or to lack of thorough mixing.

CLEANING STEREOTYPE METAL.

Stereotype metal should be occasionally cleaned or purified. This may best be done by immersing in the metal a piece of green wood, attached to the end of an iron rod. The wood should be left in the metal until the boiling ceases. Great quantities of gas and vapor are evolved and the acids in the metal are sufficiently reduced.

Another method is as follows: Heat the metal until the temperature is sufficient to brown a piece of thick white paper without burning, and throw a little powdered rosin into the pot and stir constantly.

It is claimed that zinc can be removed from stereotype metal by heating very hot, stirring thoroughly and then scattering over the surface a mixture of three parts of sulphur and one part rosin. Then burn off with oil and skim. Repeat the operation and add a small quantity of antimony.

CHAPTER VI.

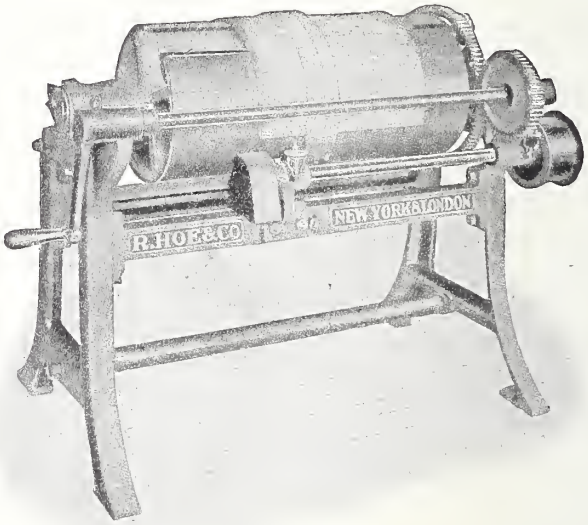
SAWING.

HAVING obtained a good cast, the next step is cutting off the tail, or jet, which is accomplished, in the case of the curved plate, by a " cutting-off cylinder." This is an iron cylinder mounted on a shaft supported in journals formed in the frame of the machine. Near one end of the cylinder is a rapidly revolving tool whose numerous teeth forming the cutting surfaces are beveled at an angle corresponding with the bevel required on the end of the plate, which provides a means of locking the plate upon the press.

The plate having been turned out of the casting box onto the cylinder and secured thereto by a broad leather strap passed around it, the cylinder is slowly revolved by means of a crank to whose shaft is keyed a small pinion which engages a larger gear wheel secured to the cylinder shaft. The revolving plate is thus passed under the rotating cutter, which severs the jet from the cast, leaving a smooth beveled edge. In some machines the cylinder is revolved by means of steam power instead of the crank, and in others the cutting off and shaving are done at the same time. A description of this machine will be given under the head of shaving machines.

The rotating or milling cutters used in cutting-off machines are made of the best tool steel tempered to an

extreme degree of hardness. They do not require, therefore, to be ground often, but when they are ground it is imperative that the original angle should be preserved. As few foundries have facilities for grinding such tools, it is customary to send them out to a pro-

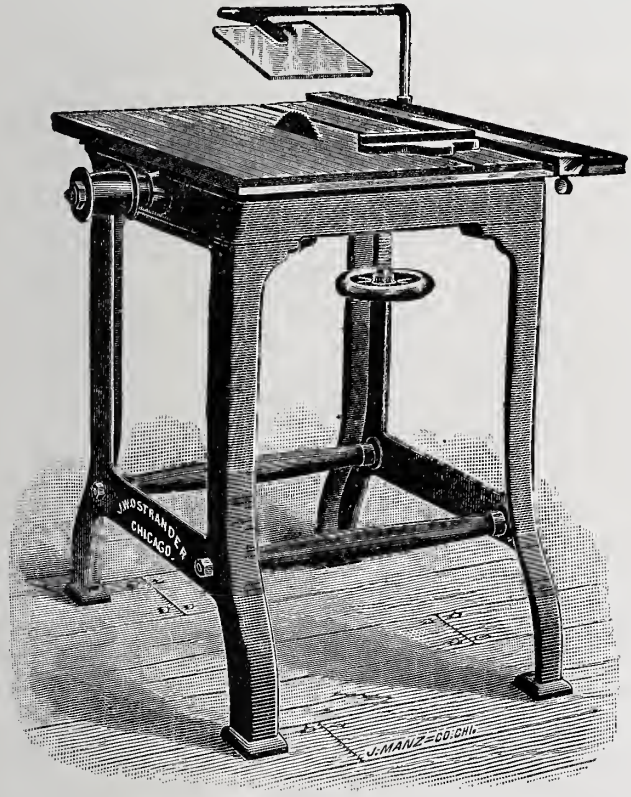


CUTTING-OFF CYLINDER.

fessional grinder. They may be whetted occasionally with an oil-stone, but even this should be carefully done, and only by an expert.

In flat newspaper work, the jets are cut off by a circular saw. In the larger foundries the plate is turned out of the casting box onto a flat iron table with the jet projecting over its edge. Immediately

over the edge of the table, and secured to the ceiling by hangers, is a swinging arm in whose lower end a saw mandrel is mounted. In the upper end of the arm is a counter-shaft and pulleys for transmitting power to the saw. When not in use the lower end of



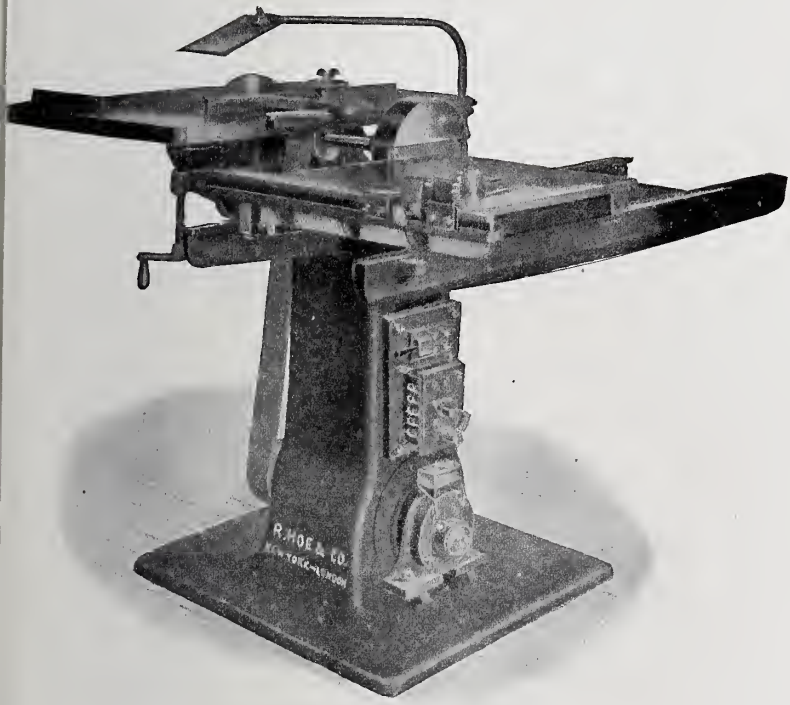
Stereotypers' Saw.

the arm is swung back out of the way of the workmen and kept in that position by a counter-balance weight. The operator by means of a handle attached to the arm, draws the revolving saw toward him, quickly severing the jet, which drops into a waste box. On releasing the handle the arm is returned to its original position by means of the counter-balance weight.

As the arm swings in a segment of a circle whose diameter is about twelve feet, it is obvious that the saw must be quite large in order to present a cutting edge throughout its travel, which projects below the edge of the table. It is customary to employ for this purpose a cross-cut saw, sixteen inches in diameter, No. 12 gage and with about four teeth to the inch. It should be driven about 2,000 revolutions per minute.

In smaller establishments no special machine is required for cutting off the jets, the work being done on an ordinary saw table. The disadvantages of this method of cutting consist in the danger of binding or twisting the saw, which is usually small and light; and the tendency to bend or warp the plate if sawed while hot, which is often necessary. This danger may be avoided to some extent by turning the plate, face down, upon a piece of cardboard, and keeping it in that position while cutting off the jet. The operator is thus enabled to keep the plate flat upon the saw table, which will prevent its warping and lessen the danger of injury to the saw.

Sawing machines are of various designs and sizes, but do not differ in principle. On page 73 is illustrated a light, easy-running, but solid and compact machine, designed for general work. The saw mandrel is driven



Combined Saw and Trimmer.

by a counter-shaft and pulleys which are furnished with the machine, or preferably by a self-contained electric motor. The rear end of the table is hinged to the frame of the machine, and the front rests upon the end of a screw which terminates in a hand-wheel, by means of which the top may be adjusted to any desired height, for sawing mortises, etc. An adjustable side-gage and a sliding end-gage are features common to all

stereotype saws, as is also the glass saw guard for protecting the eyes of the operator from flying chips and sawdust.

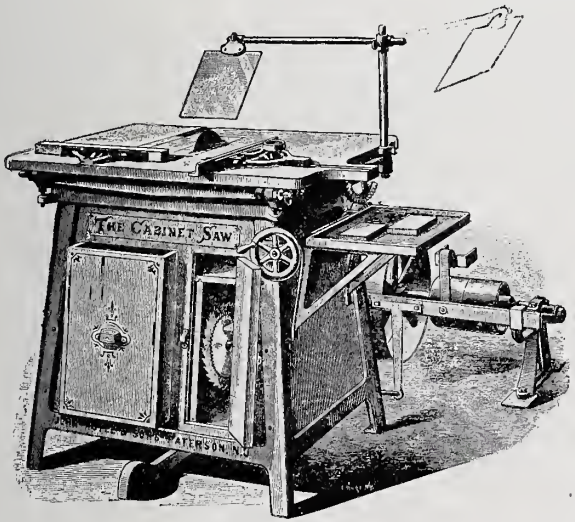
The engraving on page 75 shows a combined saw and trimmer. The saw is similar to the one shown on the preceding page, but in this machine the saw mandrel projects beyond the side of the table and is provided upon its outer end with a circular wrought-iron cutter head, in which are secured, by counter-sunk set screws, two or more cutters, for squaring up type-high (.918 inch) stereotypes. The work is carried to the cutters upon a sliding-bed which is furnished with a right-angled adjustable gage, and mounted upon ways running parallel with the face of the cutter head.

The cabinet saw shown on page 77 presents some novel features not shown in the other illustrations. The table top is hinged at the front instead of the rear, and is adjusted to height by means of the hand-wheel and worm shown at the right of the machine. This saw is provided with a dust drawer, tool closet, removable shelf, removable ripping fence and throat plate gages.

To provide a means of rapidly changing the saws in a machine which is used for different kinds of work, such as zinc or brass and stereotype metal or wood, a machine has recently been devised which is provided with two arbors, joined on a swinging arm, one of which carries the soft metal saw and the other the brass or zinc cutting saw. But one mandrel revolves at a time, and while it is in operation, the other mandrel is beneath the machine out of the way of the operator, as shown in the engraving on page 79. The mechanism for changing the swinging arm and its mandrels is

operated by the crank handles at the right-hand corner of the machine. The change can be made in a few seconds while the machine is running at full speed.

Saws for sawing stereotype metal should not be larger than the requirements of the work demand. It is usually desirable, and sometimes necessary, to employ



Cabinet Saw.

a thin blade, from 18 to 20 gage, to saw out column rules, or between lines, and a saw of this thickness, if made larger than eight or nine inches in diameter, will be liable to wind; while on the other hand, if the saw is just large enough to project slightly through the work, this tendency will be reduced to a minimum. The diameter of the saw must depend, of course, upon

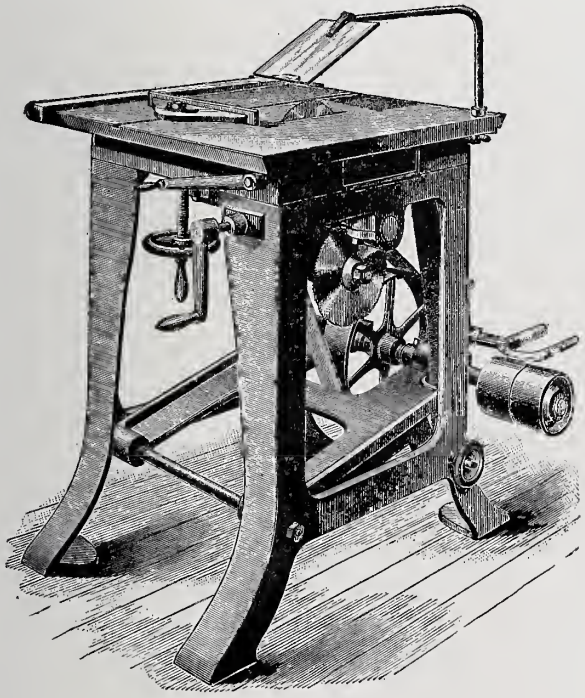
the distance between the saw mandrel and the table top. For instance, if the mandrel is three inches below the table top, a nine-inch saw would be required to give sufficient cutting surface above the table and to allow for a reasonable amount of wear and resharpening. In most machines, however, the mandrel is located within two and one-half inches of the top, or even less, thus permitting the use of smaller saws. For general use, and under usual conditions, a cross-cut saw eight inches in diameter, No. 19 gage, and with about five teeth to the inch, is found to be the most practical and convenient. Such a saw should be driven about 4,000 revolutions a minute.

The impression which prevails among many, particularly among novices, that saws for this class of work require an especially hard temper is erroneous. Stereotype metal is not harder to cut than many kinds of wood, and a saw tempered for wood work is much preferable to a harder temper, for it is less liable to crack, and much easier to keep in order.

To cut easily and freely without sticking or filling up, saws should be kept sharp, round, evenly set and the teeth should all be filed with the same angle and without hook.

To keep the saw round it should be jointed or trued up occasionally. This may be easily done by elevating the saw table until only the longest teeth of the saw project through the slot in the top. Then start the machine and with a piece of emery stone grind down the teeth of the saw until they will no longer reach the stone. If on examination it is found that there are some teeth which have not come in contact with the

stone the table may be lowered slightly and the grinding continued until the shortest teeth are touched. If the saw mandrel fits accurately the hole in the saw and no more filing is done than is necessary to bring the



Double Saw.

teeth to a point, it is obvious that a perfect circle will have been obtained.

The saw may be set by laying it on a block of hard wood and striking every alternate tooth with a hammer

or punch, and then turning it over and repeating the operation with the remaining teeth. It requires considerable skill, however, to set a saw evenly in this way and it is preferable, particularly for the novice, to use a carpenter's saw-set, which may be purchased at any hardware store.

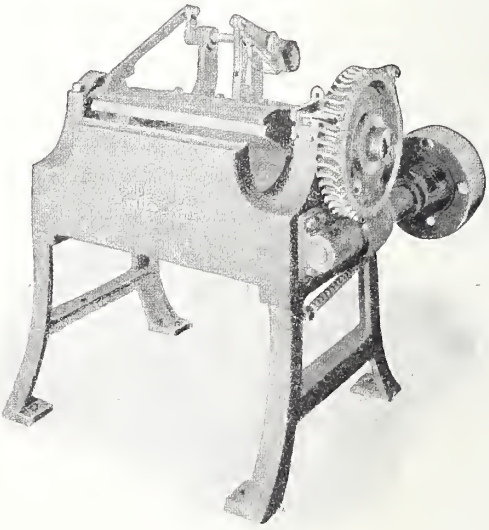
To file a saw properly it should be clamped between two round blocks about one inch thick and one inch less in diameter than the saw. The blocks may be clamped together on the saw by placing them in a vise. The teeth should be filed straight across and should not lean forward of a line drawn from the center of the saw to its periphery.

CHAPTER VII.

SHAVING MACHINES.

THE modern shaving machine for circular newspaper plates is made in the form of a semi-circular trough of iron, lined with polished brass, to protect the face of the plate from injury. Just inside the edge of the trough and parallel with its length, is a steel stop which prevents the pressure of the shaver knife from forcing the plate out of position. Directly over the center and extending longitudinally over the trough is a heavy steel shaft supported by journals which are part of the framework of the machine, and so located that its center represents the center of a circle, a part of whose periphery would be the inside of the trough. To the shaft is secured a massive iron frame to which is bolted a heavy steel cutting blade. When the shaft is revolved it causes the knife blade to describe a circle, whose periphery corresponds exactly with that of the cylinder of the printing-press for which the cast plate is to be made. In operation, the plate is placed face down in the trough, with one edge firmly held by the steel stop. Power being applied to the shaft, the knife starts on its circular travel, scooping out the superfluous metal from the inside of the plate, leaving it of uniform thickness, and with a perfectly smooth interior. It will be remembered that these plates are cast with ribs to facilitate this operation of

shaving. It was formerly the custom to cast plates solid, without the ribbed back; and the shaving machine employed to shave the solid plate was made on the principle of an auger, which started at one end of the plate and bored out the interior, an operation which

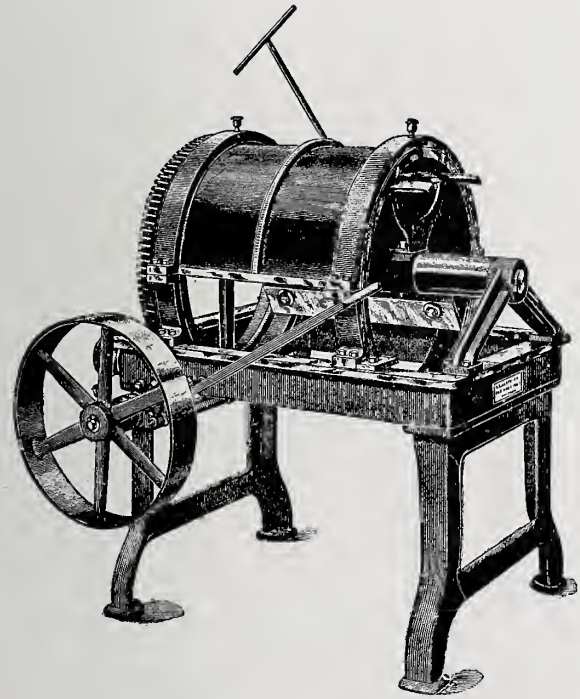


Curved Shaver.

consumed several minutes; whereas the machines now in use perform their work in thirty seconds or less. As the boring machine is now obsolete, a detailed description of it will be omitted.

A novel and effective shaving machine, shown on page 83, which has been invented, is made in the form of a complete cylinder, open at both ends, which re-

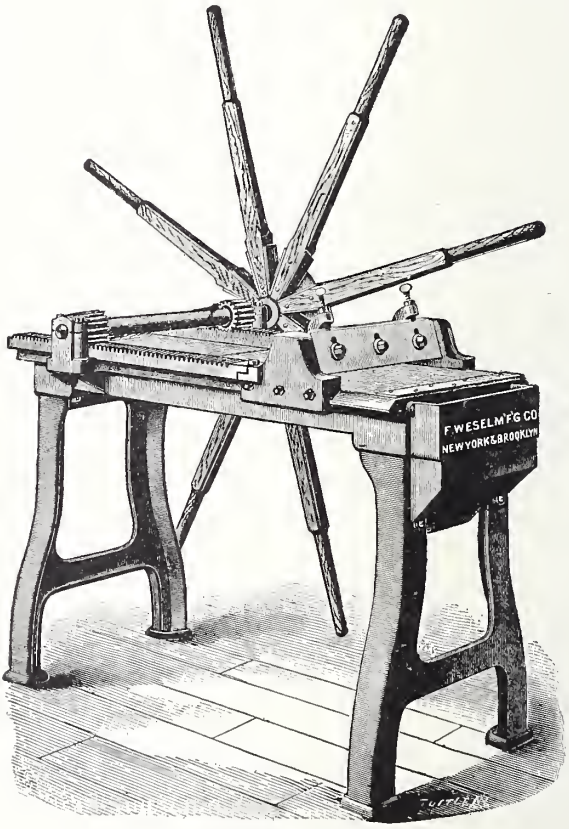
volves around a stationary knife blade, carrying the plate with it, while a rapidly revolving cutter head, carrying two blades, severs the jet from the plate at the same time. The plate is turned from the casting box



Curved Shaver and Tail Cutter.

directly into the cylinder and firmly clamped into position by the action of a single screw, operated by a socket wrench. Nearly all shaving machines for circular work are now operated by steam power, but there

are still in use machines which are operated by a crank with fly-wheel attachment, both secured to an auxiliary shaft on which is keyed a pinion engaging a larger gear-wheel on the knife shaft. The work is, of course,



Hand Shaver.

exceedingly laborious, and requires the combined efforts of two men.

Shaving machines for flat work are of various patterns and sizes, some of which are operated by steam power and some by hand. The hand machine consists of an iron table surfaced perfectly true upon its upper surface and provided with a stop at one end to hold the plate in position. The side edges of the table are also machined true, both top and bottom, and serve as guides for a sliding head to which the knife is bolted. Secured to the rear of the head and traversing the entire length of the machine are steel racks, one on either side, which are engaged by two pinions located on a shaft which is at right angles with the racks. To one end of the shaft a cast-iron spider is keyed, and to the spider long wooden spokes are bolted which afford the means of operating the head. The head is provided with steel gibs so that the wear may be taken up by means of set screws which act on the gibs.

A modification of this machine consists in the addition of another spoke wheel located on the opposite side of the machine, by means of which the operator may have assistance in shaving large plates. Most machines are provided with a spring roller located in front of, and attached by brackets to the head. The purpose of the roller is to press the plate flat down on the bed of the machine just before the knife begins its cut. A plate which is slightly uneven or warped is thus secured against the danger of "gouging" and the necessity for filing or cutting a bevel on the end of the plate is also obviated.

In large establishments shaving machines are

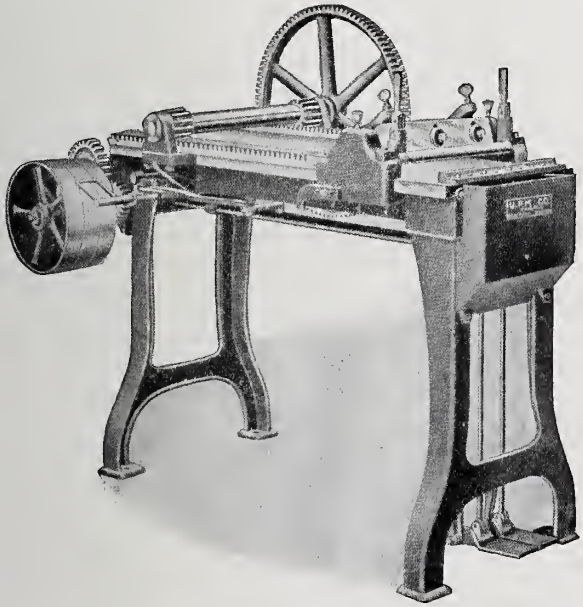
usually driven by power. There are various devices for applying the power, one of which is illustrated in the machine shown on page 87. The shaft and pinions acting upon the rack are the same as in the hand machines described. A large gear wheel is substituted for the spoke wheel on the main shaft and is driven by a pinion to whose shaft power is communicated through intermediate gearing, by means of pulleys shown at the left of the machine.

When not in operation the driving belt runs upon the central pulley, which is loose upon its shaft. To operate the machine the belt is shifted to one or the other of the outside pulleys and forward or backward motion thus communicated to the shaver head.

The belt shifters are operated by two pedals conveniently located under the front of the machine. The head is prevented from going too far back by an automatic trip which shifts the belt and at the same moment applies a brake to the driving shaft.

Shaving machines are usually made so that type-high (.918-inch) or thin plate work (1-6 inch) may be shaved with equal facility. This is accomplished by adjusting the knife and stop for type-high work, and the machine with a false bed whose thickness equals the difference between the two classes of work. In machines of this kind more or less inconvenience is caused by the necessity of removing the false bed every time the work is changed. To overcome this annoyance, machines have been devised with adjustable beds by which work of any thickness from one pica (1-6 inch) to one and one-quarter inches may be shaved. The bed rests on steel wedges which are operated by a

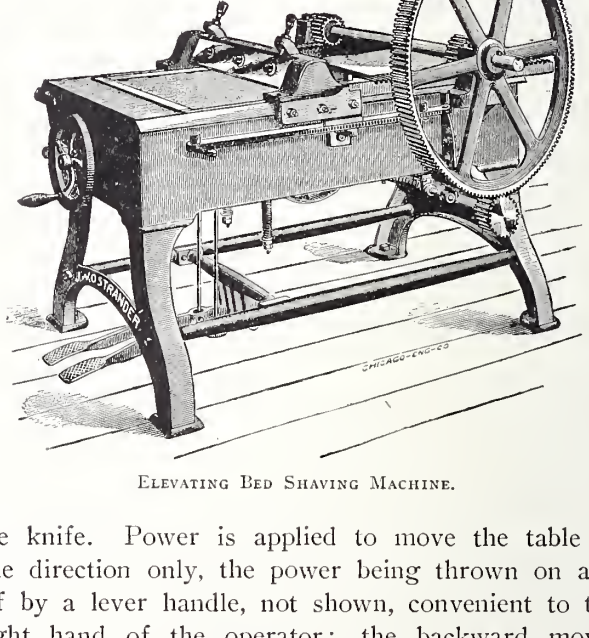
screw passing through the front of the machine and terminating in an indexed hand wheel. By means of this wheel the bed may be rapidly raised or lowered to any desired height within the range of the machine. (See page 88.)



Power Reverse Shaver.

In another form of adjustable shaver the knife is raised and lowered instead of the bed. The knife is bolted to a sliding plate which is mounted on the face of the shaver head and is raised and lowered by two screws terminating in gear wheels driven by an intermediate gear which is located on the

same shaft with an indexed hand wheel. By turning this hand wheel both screws are operated simultaneously, thus accurately adjusting the knife, which always remains parallel with the bed. This machine is of new design and differs in many respects from other makes. The following description is given by the maker: "The knife remains stationary, the plate to be shaved being placed on a table and passed under



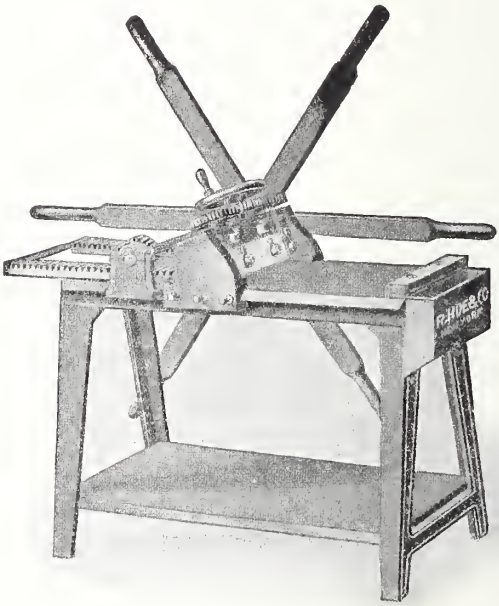
Elevating Bed Shaving Machine.

the knife. Power is applied to move the table in one direction only, the power being thrown on and off by a lever handle, not shown, convenient to the right hand of the operator; the backward movement is obtained by means of a hand wheel. The

table is extended beyond the head toward the front of the machine, affording increased bearing surface and equalizing the wear over all parts of its length; the extended portion is made slightly concave on which plates may be bent so that they shall rest properly on the shaving table. At the front of the machine, on the left side, is an inverted plane by which plates may be beveled as is usual to prevent the too abrupt commencement of the shaving operation. The cutting edge of the plane is protected by a hinged guard, which, by a spring, is held a little above the knife but readily yields to pressure and does not interfere with the operation of beveling, which is performed by drawing the edge of the plate across the face of the plane." A shaft running through the body of the machine is provided with a pinion which engages a rack bolted to the under side of the sliding table or bed. One end of this shaft terminates in the hand wheel which is employed to reverse the machine and the other is provided with a worm wheel which is driven by a worm secured to a shaft running parallel with the length of the machine, and to which is also attached the band wheel for transmitting power for the forward movement of the bed.

The accuracy of the work performed by shaving machines depends largely on the grinding and lapping of the knives. The cutting edge of the knife must, of course, be an exact straight edge in order that the shaved plates shall be of equal thickness throughout. To secure this straight edge, and at the same time obtain the proper clearance, the shaver knife is lapped after it is ground. A perfectly flat iron or steel plate is

covered with fine emery powder and oil, and on this the knife, which is clamped to an angle plate or gage whose face corresponds very nearly to the shaver head, is lapped, first across the plate and then from end to end,



Adjustable Knife Shaver.

and finally in large sweeping circles, frequently changing from one position to another in order that the level of the plate shall not be impaired by excessive wear in one spot. The face of the shaver head to which the knife is bolted is planed to an angle of about fifteen degrees. That the knife may have sufficient clearance,

the face of the angle gage should have about one degree more, for it is obvious that if the angle of the gage should be the same as the angle of the shaver head, a knife lapped in this position would not shave the plate, but would drag over it. If, however, the top of the knife be tipped forward slightly, the heel of the knife will be raised sufficiently to obtain the necessary clearance. As it would require much unnecessary labor to lap the entire thickness of the knife, it is customary to grind away the heel, leaving only about one-eighth of an inch of surface to lap. While it is essential that the heel of the knife should be raised sufficiently to prevent dragging, it is just as important that there should not be too much clearance, for in the latter case the knife would dip or gouge into the plate, particularly when commencing or finishing a cut, thus making the plate too thin at the ends. It is well therefore to make a difference of not more than one degree between the angles of the face of the shaver head and the face of the angle gage. The travel of the shaver head should not exceed twenty feet per minute and for most work twelve to fifteen feet is a better speed.

It is impossible to shave a plate accurately unless the cut taken be very light. A heavy cut will lift the plate in spite of pressure rollers or any other precaution that may be taken to prevent it. If the plates are cast too thick, the casting box gages should be planed or ground down until the thickness of the cast has been reduced to a point where a very light shaving will be sufficient to finish it.

The roughing machine is employed in large establishments to take the first or rough cut off from the

stereotype plate when more than one cut is required. Its chief utility consists in the fact that a large quantity of metal may be removed at one operation. The plate rests upon a traveling bed and is held down during the operation of cutting by two spring rollers, located one on either side of the track of a reciprocating cutter head. The cutter is supported by a tool post formed on the cutter head and the head is arranged to slide on an arm extending over the traveling bed and at right angles therewith. The head is actuated by a pitman, or connecting rod, one end of which is connected with a stud on the cutter head and the other with a crank pin on the driving pulley. The bed is operated in one direction by a worm which is driven by a belt from a pulley on the main drive shaft and is moved in a reverse direction by hand.

While this machine was originally designed, as its name implies, for rough work, yet a carefully constructed machine can be made to do its work so accurately that no further facing or shaving is necessary; and in many foundries it really takes the place of the shaving machine.

CHAPTER VIII.

TRIMMING.

FLAT stereotype plates, whether for job or newspaper work, usually require to be trimmed on the sides and ends to reduce them to a standard size. In the case of wood-mounted job plates the trimming is done after they have been mounted on blocks when plate and block can be finished at the same time.

As a reasonable degree of accuracy is desired in the finished plate, particularly in the case of newspaper columns, the saw is unsuitable for such trimming on account of its tendency to spring away from the work and because its cut is more or less ragged and uneven.

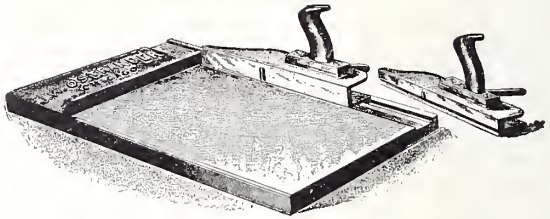
Various machines have been designed for the finishing of sides and ends of such plates, the most popular of these being the Shoot-board and the Trimmer. The former is used for finishing book plates and small jobs and the latter for general work. For special work, such as newspaper columns and advertising cuts which are worked upon the separable plate and base plan, machinery is employed which finishes both sides of the plate at the same time.

The simplest form of a trimming machine is a shoot-board in which a plane, supporting an adjustable cutter blade and furnished with a defending tongue, slides freely in a groove or guide way formed in the top of an iron bed-plate. A stop, extending across the

bed at right angles with the groove, serves as a limit gage and stop for the stereotype plate and also as a guide for squaring the plate.

Two planes are furnished with the shoot-board, one for finishing the plate with a square edge, and one for producing a beveled edge. The method of operating the machine is illustrated herewith.

On page 95 is presented a novel and effective shoot-board which is operated by power. The advantages



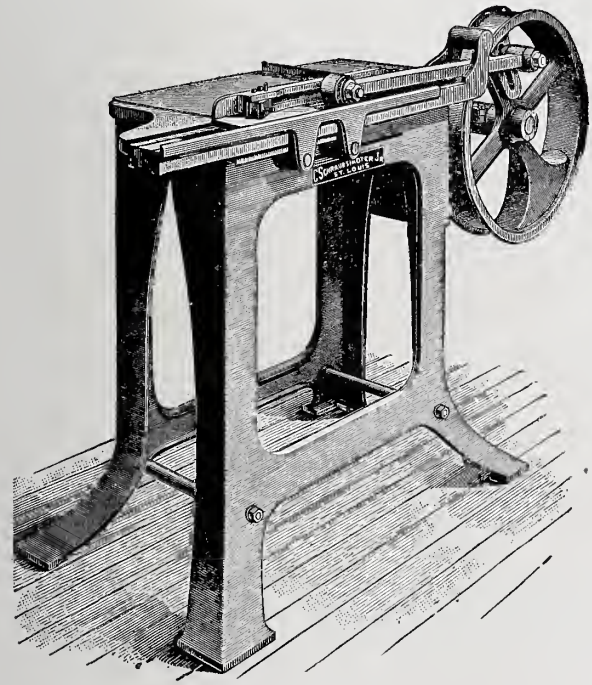
Shoot-board and Planes.

claimed for it are absolute safety to the operator, perfect accuracy and smooth finish in the work performed. A slot in the crank arm of the drive wheel admits of ample adjustment of stroke to accommodate various sizes of work.

A very convenient and efficient trimming machine is shown on page 96. A rapidly rotating arbor or spindle carrying a cutter head in which are secured, by counter-sunk set screws, two or more cutting tools, is journaled in a substantial iron frame.

The work is carried past the cutters on a reciprocating carriage which slides on ways parallel with the face of the cutter head. The carriage is furnished with

a right-angled adjustable gage, against which the work rests, and which is operated by a finely threaded feed screw admitting of close and accurate adjustments. These should admit of standardized pica dimensions.

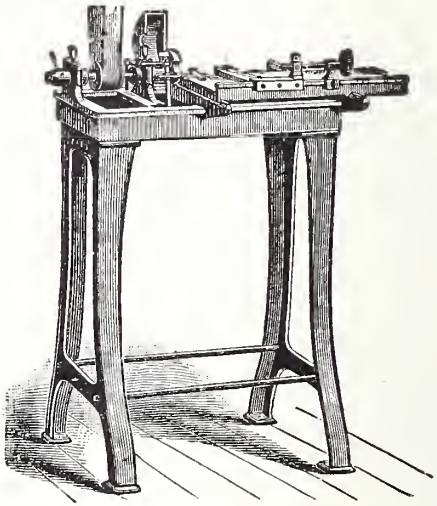


Power Shoot-board.

For job work the dimensions of the trimmer carriage are about 12 by 16 inches, but for flat newspaper work where it is often desired to trim the sides and ends of a whole page, the carriage is made as large as

20 by 24 inches, and may be made even larger, of course, should the work demand it. To perform smooth and accurate work the trimmer head should make about 3,500 revolutions a minute.

To prevent the work from being drawn into the knives and injured it is essential that it should be held



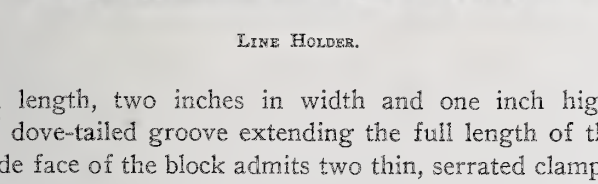
Job Trimmer.

securely on the carriage. Large and heavy pieces of work, if they have first been shaved and straightened, may be easily and without danger held by the fingers, as their weight is nearly sufficient to resist the tendency of the tools to draw them away from the guide.

Long and narrow pieces, such as single column newspaper plates, require to be held at both ends. This

is a matter of some inconvenience to the operator on account of the long reach involved and because, with both hands thus engaged, he can operate the adjusting screw, by which the plate is fed to the cutters, only at a great disadvantage. To reduce to a minimum the danger and difficulty of holding such pieces an automatic clamp has been devised which relieves the operator from the necessity of holding one end of the plate, thus leaving one hand free for the adjustment of the side gage. In trimming long plates it is obvious that the front end (the end farthest removed from the operator), unless held to the carriage, is liable to chatter or spring up when undergoing the action of the cutters, and to obviate the necessity of holding it by hand, a presser foot is provided upon the carriage which can be automatically raised and lowered each time the carriage is reciprocated in operation.

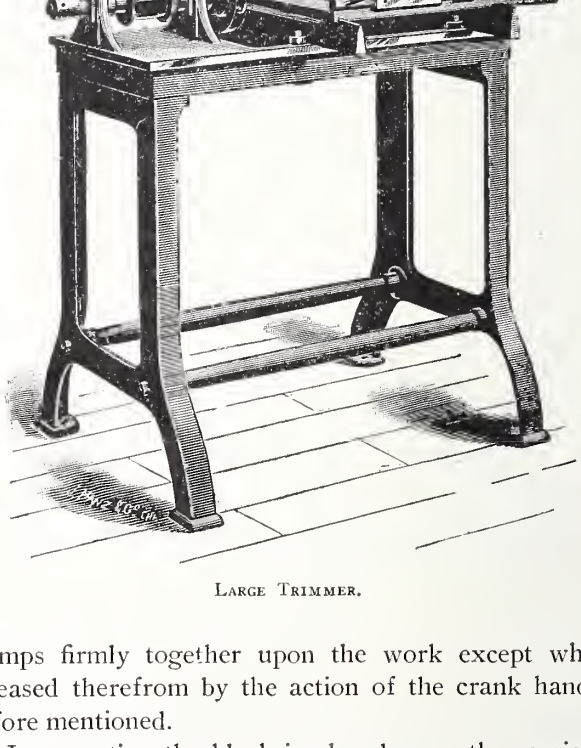
Very small pieces of work, such as one, two or three line stereotypes, are held in a special line holder. This is an oblong block of iron ten or twelve inches



Line Holder.

in length, two inches in width and one inch high. A dove-tailed groove extending the full length of the side face of the block admits two thin, serrated clamps, one of which is secured by means of a set screw at any

desired distance from the end of the block, and the other is pivoted to the end of a lever which is operated by a crank handle on the top of the block. The under side of the block is recessed to receive a spiral spring which is attached to the lever and serves to hold the



Large Trimmer.

clamps firmly together upon the work except when released therefrom by the action of the crank handle before mentioned.

In operation the block is placed upon the carriage of the trimmer, the clamp jaws separated by means of

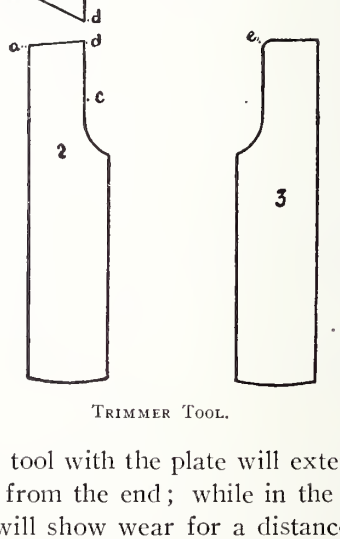
the crank handle and the work inserted between them. On releasing the handle, the spring, acting upon the lever, draws the clamps together. The work is thus held securely and may be trimmed without danger to the eyes or fingers of the operator, provided the line holder itself be held firmly against the side gage of the machine during the operation of trimming.

It should be impressed upon the workman that whether trimming small or large pieces, it is important that the carriage of the machine should be kept free from chips. More accidents have been caused by carelessness in this regard than from all other causes combined. A chip or small piece of metal under the work will cause it to chatter or rock when it encounters the cutters, with the result that the workman often loses control of it; and even if he is not injured by flying fragments his work will be destroyed.

Two kinds of cutters are used in trimming machines, one for trimming metal work and the other for wood or wood and metal combined, such as job or book plates mounted on cherry or mahogany. Both are made of Stubbs tool steel, hardened, and the temper drawn to a purple color. The holes in the cutter head are usually round, in which case round steel, of a size which will accurately fit the holes, should be used for tools. The cutting end of the tools, however, must be squared for at least a half an inch back from the end. That is to say, there must be one right-angled corner to do the cutting.

As the back of the tool has no work to do, its form is immaterial and it may be left in the shape of the original form of the steel.

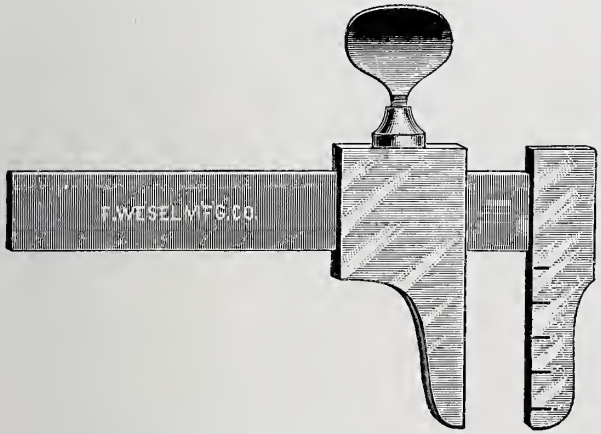
Fig. 1, shown below, is a plan view, Fig. 2 a side view and Fig. 3 a rear view of a metal cutter; c is the cutting edge and c1 the cutting end of the tool. It is obvious that with a cutter of this shape most of the work will be done by the point, or right-angled corner, d, for as the amount of metal cut from the stereotype plate at one time rarely exceeds 1-16 of an inch, the



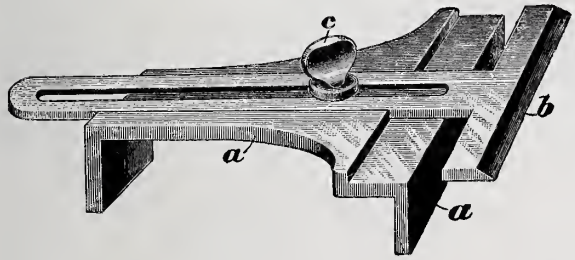
Trimmer Tool.

contact of the tool with the plate will extend only that distance back from the end; while in the other direction the tool will show wear for a distance back from the point corresponding with the travel of the trimmer carriage during the time the cutter is passing the plate. As the cutter has a travel of over 2,000 feet per minute while the travel of the carriage rarely exceeds 30 feet per minute, it is evident that the wear in this direction is not appreciable.

In order to make the tool last as long as possible without grinding, this corner should be slightly rounded



Type Gage.



Lining Gage.

as shown at e, in Fig. 3, and the end and side faces of the cutter should be backed off slightly at a and b to provide clearance.

On page 103 is a view of a machine specially designed to be used in the finishing of that class of stereotype plates having one or more longitudinal legs with inclined side surfaces whereby they may be locked in the form to bases having one or more upward projections adapted to engage the inclined faces of the leg. The operations performed by the machine are the trimming of the side edges of the plate, the trimming of the inclined face of the leg or legs, and also the formation of a horizontal under-bearing surface upon the cored or hollow part of the plate. These operations are all simultaneous, and the plate after undergoing them is finished, ready for the press.

Some features of the invention are, however, well adapted for use in trimming plates having other modes of fastening than that mentioned, and in which the longitudinal leg with the inclined side face is not present.

The invention consists in two rotary cutter heads adapted to trim the plate edges, placed opposite each other, and at a distance apart corresponding to the width desired for the plate, and an inclined rotary cutter or cutters located to operate upon the side face of the under leg or legs of the plate, with reciprocating carriage for moving the plate up to the cutters.

The cutter arbors are made horizontally adjustable, by which means the wear of the cutting tools may be compensated for, and errors of adjustment of the cutting tools readily corrected.

The plate-holding carriage is slotted throughout that portion of its length covered by the plate to give access to the under cutter, the plate straddling the slot.

Double Trimmer.

A vertically acting clamp coextensive with the plate in length is mounted upon the carriage and is used to hold the plate rigidly during the time it is being trimmed, and serves also as a guide for the alignment of the plate. The clamp is operated by a lever handle, which also serves the operator as a handle for pushing the carriage to and from the cutters.

To prevent injury to the printing surface of the plate the bottom of the clamp is faced with a sheet of rubber or leather.

The inclined under cutter is adjustable in two directions, thus providing a means of taking up any wear of the cutter and for changing either the depth of the cut or its location.

The cutters used on this machine are novel in construction, those employed for trimming the side of the plate being cup-shaped and furnished with six or more cutting teeth. These teeth are formed so as to produce a shaving cut, the object of which is to enable the operator to crowd the work through the machine more rapidly than would be possible with one or two cutting tools only, and at the same time leave a smooth and finished surface.

The under cutter is provided with ten teeth so ground as to leave ample clearance at the ends and sides.

This machine admits of very rapid execution, a good operator having by actual count trimmed six full-length columns, sides and bottom, in forty seconds.

To produce the best results the side cutters should be driven about 4,000 revolutions a minute. A higher speed would not add to the capacity of the machine

because the increased friction would result in a wear of the cutters which would not be compensated for by the increased velocity. This fact holds true with all cutting machines — that there is a limit to the speed at which they can be operated with economy.

CHAPTER IX.

ROUTING AND BEVELING.

WHEN stereotypes are produced from molds of zinc etchings or other cuts in which the relief is shallow, or when the matrix of a type form has not been carefully packed, more or less routing or chiseling must be done to deepen the relief sufficiently to prevent blacking or smutting the paper in printing. In newspaper work the curved plates, after having been shaved, are placed on a circular iron horse, or bench, raised to a convenient height from the floor, and the superfluous metal is removed from the edges with an iron hand plane. The reliefs are then deepened, where necessary, with mallet and chisels. The ordinary chisels used by carpenters are too long to be used advantageously for this purpose, but may be made to answer admirably by cutting off one-half the blade and inserting the chisel further into the handle. Three or four sizes of chisels and gouges are employed, some with straight blades, and others bent or off-set so as to facilitate their operation in places where the use of a straight chisel would bring the fingers of the workmen in contact with the plate, or would be otherwise inconvenient.

Flat newspaper plates are finished in much the same manner except that a flat iron finishing plate takes the place of the iron horse. Both horse and plate are provided at one end with raised stops against which the

plate rests during the operation of chiseling. When the quantity of metal to be removed is considerable, as is sometimes the case with illustrated book or flat newspaper pages, the work may be done much more rapidly and accurately with the routing machine, an illustra-

Finishing Cylinder.

tion of which is shown on page 109. A rapidly revolving vertical spindle carries on its lower end a chuck in which may be secured cutting tools of various sizes suited to the nature of the work. The bearing in which the spindle turns is fastened to a bar, one end of which serves as a handle for guiding the tool over the work, while the other end is pivoted to a second bar which is

in turn pivoted to the frame of the machine. The double joints thus formed permit the tool to be moved freely in any direction over the surface of the machine. The second bar is supported, at the elbow formed by pivoting together the first and second bars, by a steel segment, and the first bar rests on a straight edge of hard wood extending the entire length of the machine. The ends of the hard wood slide are supported upon spring studs, which hold the handle bar carrying the spindle high enough from the table so that the cutting tool clears the work when not in operation. A pedal attached to a lever underneath the machine offers a convenient means of compressing the springs, thereby dropping the handle bar and permitting the tool to enter the work. The tool spindle is adjustable in a vertical direction to provide for work of different thicknesses, as when a change from type-high to plate work or *vice versa* is desired. This adjustment is obtained by means of a hand wheel attached to a threaded sleeve in which the spindle turns. The sleeve is provided with a feather to prevent its turning so that a movement of the hand wheel in either direction raises or lowers the spindle.

The work is held by screw clamps which slide freely in dovetail grooves planed in the bed of the machine. Power is transmitted to the tool spindle by a belt passing over idle pulleys attached to the frame of the machine to the smaller of two cone pulleys which turn freely on a stud, an extension of which forms the pivot for the junction of the first and second bars. The larger of the cone pulleys is connected by an endless belt with the tool spindle. To provide a means of taking up the stretch of the endless belt, the bearing

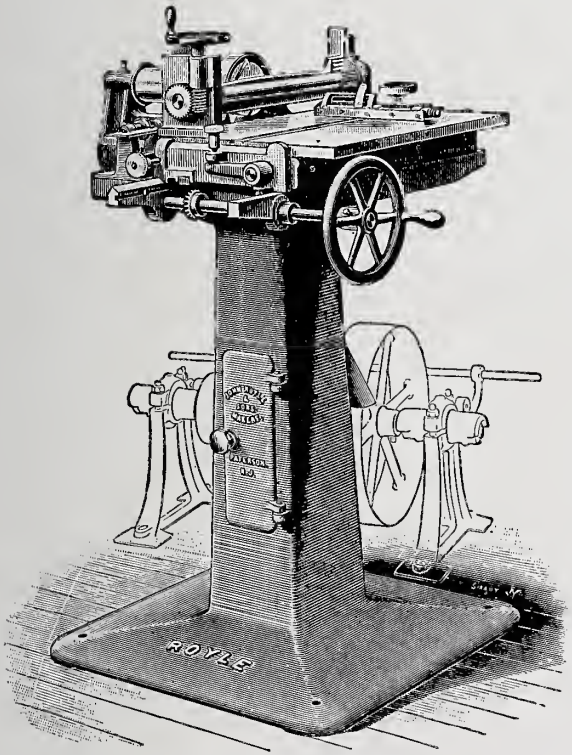
Routing Machine.

carrying the tool spindle is made adjustable on the handle bar.

It will be observed that the location of the pulleys at the pivotal points of the radial arms enables the operator to move the tool spindle freely in any direction without in any way changing the tension of the belt.

To perform smooth and rapid work router tools require to be driven at a high speed. For routing stereotype metal the speed should be not less than 12,000 revolutions per minute. A machine running so rapidly should, of course, receive careful attention. The bearings must be kept clean and well oiled and must not be permitted to become overheated. Router tools for general work are about the size of a lead-pencil. For special work they are made as small as 1-16 of an inch in diameter, and when it is necessary to remove a large quantity of metal from one spot or where the spaces to be deepened are very large, the size of the tool may be increased to ½ inch. For ordinary work, however, the size first mentioned will be found most serviceable. The most effective tool for soft metals is made of Stubbs steel tempered to a purple color. The cutting surface is made in the shape of a half moon, as shown in Fig. 4, page 115, the leading point being slightly longer than the heel to prevent clogging. This tool is sharpened by grinding the end only and may therefore be easily kept in order. To operate the machine the work is placed on the bed as near the center as possible and secured by the screw clamps. The tool spindle is then moved over the work and the height adjusted by means of the hand wheel until the tool just clears the plate. The machine is then started and the tool having

been brought exactly over the space which it is desired to deepen, the operator places his foot on the treadle, bringing the cutter into contact with the plate. By means of the two handle bars the tool may be moved back and forth or in circles until the superfluous metal has been removed, when by releasing the pressure on



Improved Beveling Machine.

the pedal, the tool is automatically raised clear of the work and may be moved over to the next space.

Book plates, when finished ready for the press, are usually mounted on "patent blocks," i. e., iron bases. The plates are secured to the bases by bevel clamps which lap over the edges of the plates. It is necessary, therefore, to provide a beveled edge on the plates. This may be done on a shoot-board by employing a bevel plane, but when a large number of plates are to be beveled, it is more economical and satisfactory to employ a beveling machine.

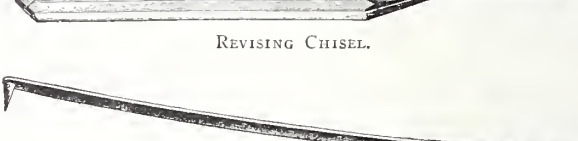
This machine somewhat resembles a trimmer in appearance. It has a reciprocating carriage to carry the work to and from the cutters, is provided with gages for the alignment of the work, and may be quickly adjusted so as to produce either a rabbet or beveled edge to the plate, as may be desired.

CHAPTER X.

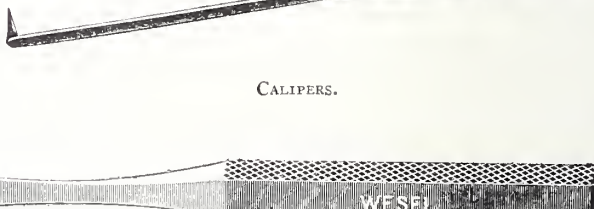
REVISING.

AFTER book plates have been finished ready for blocking, a final proof is taken from them and it often happens that errors are then discovered which have been overlooked in the first reading. It also frequently happens that the author wishes to make changes or corrections in the matter after the plates have been finished. When such changes consist of two or three words, a line or a paragraph, it is customary to set up and stereotype the corrected matter and after cutting out the defective portion of the plate the new piece is set in and soldered. When the changes are no more than parts of a word or single letters, such as might be due to typographical errors or imperfect type, the defective letters are punched out of the plate and type set in and soldered in their place. For this work special tools are required, consisting of a set of punches and chisels, a pair of calipers, a revising stick, a pair of cutting pliers, a blow-pipe, a soldering iron, some small flat files and a light hammer. A set of chisels and punches consists of eight sizes corresponding with the different sizes of type in general use, namely, pica, small pica, long primer, bourgeois, brevier, minion, nonpareil and agate. The thickness of the tools corresponds with the letter *i* in the respective fonts. The calipers are made of two strips of spring brass or steel,

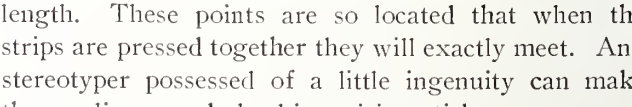
six inches in length, one-half inch wide at one end and tapering to one-fourth of an inch at the other. These strips are parallel and separated at the wide ends by a block of metal one-half inch in thickness to which they are soldered. The strips are slightly bent so that the narrow ends are separated about one inch. Through the narrow ends and exactly opposite each other two small holes are drilled in which are secured, by soldering or riveting, steel points one-fourth of an inch in



Revising Chisel.



Calipers.



Revising Punch.

length. These points are so located that when the strips are pressed together they will exactly meet. Any stereotyper possessed of a little ingenuity can make these calipers, and also his revising stick.

The revising stick is made of a piece of printer's brass rule six inches or more in length to one edge and one end of which a strip of brass one-eighth of an inch square is soldered, as shown on this page. This

Fig. 4.— Router Tool.

Daniels' Planer Tool.

Revising Stick.

makes a convenient and indispensable tool for holding a single line of type while fitting it to the slot in the plate in which it is to be soldered.

A line gage (page 101) is a convenient tool for detecting errors of alignment between the inserted type and the remainder of the line, although its more common use is for the alignment of newspaper headings or other jobs, made up of capitals and lower-case letters,

in which the capitals only come to the top of the line. In trimming a line composed of a capital letter followed by several lower-case letters, the width of the block must, of course, correspond with the width of the capital, and it is apparent that without a guide it would be difficult to so trim a block that the lower-case letters would all be at an equal distance from the top and bottom of the block. The same difficulty would occur in trimming any kind of a job requiring a margin above and below the matter. The line gage enables the operator to trim the edges of such jobs exactly parallel with the printing face and is therefore an important and almost indispensable tool to the job stereotyper. It consists first of the brass base, *a* having a right-angled face, a^1 and a groove planed in its upper surface to admit the sliding gage *b* which is secured in any desired position by the thumb-screw *c*. In operation the edge of the sliding gage *b* is set and locked by means of the thumb-screw, at a distance from the face a^1 corresponding with the desired margin on the stereotype. In revising, the edge *b* is set in alignment with the line in which the correction is to be made. After the type has been inserted, and before it is permanently secured by soldering, an application of the gage will determine whether the alignment is perfect.

The blow-pipe is used for soldering in places which can not be conveniently reached with the soldering iron. One form consists of a Y of brass tubing, one of whose arms is connected by means of a rubber tube with the gas supply. By blowing in the other arm of the Y a stream of air is mixed with the gas, adding greatly to the heat. By reason of the flexible connection the point

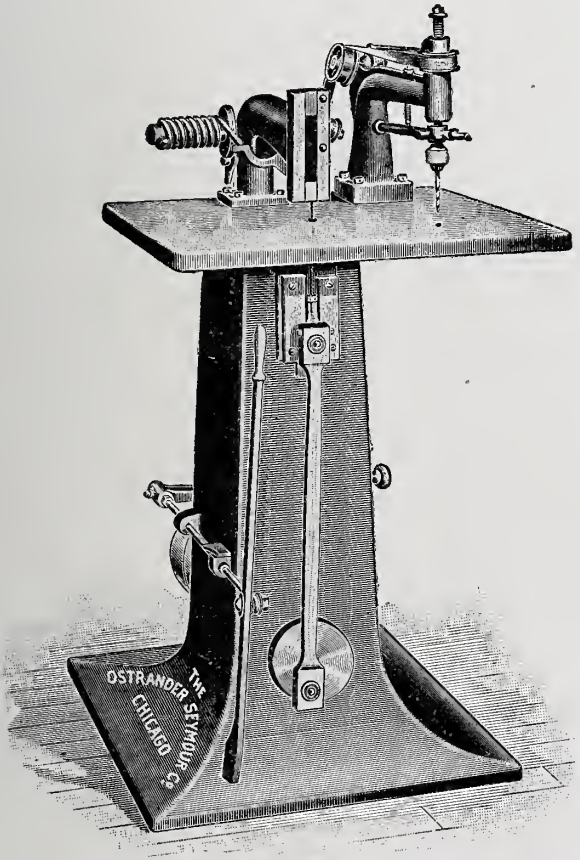
of flame may be directed accurately to the exact spot where the heat is required.

Referring to page 114, the cutting ends of the revising punches are provided with V grooves which give to the tools two cutting edges, thus admitting of a sharp clean cut through the plate just the size of the type which is to be inserted. To correct a plate, the operator first marks, with his calipers, the location of the defective letter upon the back of the plate which, for this purpose, is inserted between the parallel arms of the calipers until one end of the steel points overhangs the defective letter when the other point, which is exactly opposite, is pressed into the back of the plate or slightly scratched thereon. With a small chisel a groove is now made at the point marked by the calipers to the depth of one-half or more of the thickness of the plate. A punch of the proper size having been selected, the plate is turned over, face up, upon a block of wood and with a quick, sharp blow with the hammer, the letter is punched out. Turning the plate over again, face down, upon the finishing block, the type is inserted in the hole and the contiguous metal crowded against it with a chisel, until it is secured against dropping out, when the face is examined to see that the inserted type is in alignment with the remainder of the line, and level with the surface of the plate. Care must be taken to keep the type on its feet, that is to say, it must not lean from a perpendicular. Everything being in readiness, the body of the type which has been left projecting through the plate is cut off with the cutting pliers, level with the back of the plate, and a little muriatic acid, in which zinc has been

dissolved to saturation, is dropped on it. A small piece of solder is now dropped on the end of the type and melted either by the blow-pipe or soldering iron, thus rigidly securing it in position. It is of course necessary that the soldering shall be done with some delicacy, otherwise there will be danger of melting the surrounding metal or the type itself to such an extent as to injure the face. When cool, the superfluous solder is removed with a chisel or flat file. When necessary to insert several consecutive letters the slot made by the punch is enlarged with chisel and file to the size of the correction, and the type, which has been previously set up in the revising stick, is inserted and temporarily secured as before. Somewhat more skill is required to make a correction of this kind than to insert a single letter, as the slot must be kept parallel and in exact alignment with the remainder of the line, and this is a more difficult matter than to punch a single hole in the plate. When the slot has been made too large, as sometimes occurs, the types are aligned by crowding the contiguous metal against that side of the type which is above or below the line. When the types have been properly placed they are usually partially secured by soldering before cutting off the bodies, as otherwise there would be danger of disturbing them by the action of the pliers.

When the correction consists of several words or parts of lines joining each other, the matter is set up and stereotyped in the usual manner. The corrected piece so made is laid on the plate in the position it is to occupy and with a graver or other sharp-pointed tool its exact outline is marked on the plate. A hole is drilled in one corner and the defective portion of the

plate removed with a jig-saw. The correction is then inserted, the plate turned face down, and a drop of solder applied to each of the four corners. During the operation of soldering, the plate and the correction



Combined Jig-Saw and Drill.

should both be pressed firmly against the finishing block to prevent any warping or springing of the pieces which might be caused by the heat of the iron. For this purpose the cutting pliers may be reversed, the end of one handle being used to hold the plate and the other to hold the correction.

When the correction consists of an entire paragraph it may easily be made by sawing out the defective portion altogether, and soldering in the stereotyped substitute.

One of the most convenient tools in the foundry is the type gage (page 101). It is used chiefly for comparing the dimensions of finished work with different standards of patterns, and also for detecting inaccuracies in the height of finished work.

The tool is made entirely of steel, case-hardened to prevent wear by friction, and the adjustable jaw accurately fitted on the bar upon which it slides. The distance between the points of the jaws is about 6-1000 of an inch greater than at the heels, and the graduating marks, therefore, if the tool is accurately made, will show variations of 1-1000 of an inch. In other words, a block which could be inserted the full length of the jaws and fit snugly therein would be 6-1000 of an inch thinner than one which would barely enter the points, and 3-1000 of an inch thinner than one which could be inserted one-half the length of the jaws. Practically these measurements would not be exact, and it is not material that they should be, for the tool is not designed for measuring, but comparing. The essential feature of the tool is that, whatever may be the location of the adjustable jaw upon the bar, the distance between the

points of the jaws must always be slightly greater than the distance between the heels.

Every job stereotyper should possess a set of brass standards based upon the printer's universal unit of measurement, the pica. These standards should be twenty-six or more in number, ranging from one to twenty-six picas in length.

The convenience of such standards will be apparent when it is remembered that all large type, such as is employed for newspaper headings, etc., is made to occupy the space of a certain number of lines pica, and is for this reason called six-line type, seven-line type, etc. A six-line heading, therefore, must be trimmed down to occupy exactly the space of six pica lines, and the use of the type gage and the brass standards enables the operator to do his work with absolute accuracy, for, by locking the jaws of the gage upon his six-line standard and noting the distance the standard will enter the jaws, and afterward trimming his heading until it will enter the jaws to the same graduating mark, he may be certain of absolute uniformity between them.

In addition to the pica standards the stereotyper should have a steel block about three inches long, one and one-half inches wide and exactly type high, i. e., .918 of an inch. Such a gage is useful for testing the height of finished work, but more particularly for setting the knife of the shaving machine, for which purpose it is placed upon the bed of the machine and the knife screwed down until it will just touch it. A block of metal is then shaved by the machine and compared, by means of the type gage, with the type-high standard. Should a variation be discovered the knife may be

adjusted until the shaved block and the standard are uniform.

Book plates are usually worked upon patent blocks and must be finished exactly eleven points in thickness. For testing this class of work a standard should be provided eleven points thick, but in other respects similar to the type-high standard.

CHAPTER XI.

BLOCKING.

BOOK or job plates which are not used on patent blocks are usually mounted on blocks of cherry or mahogany and are secured thereto by screws or tacks or anchored by bolts of metal.

Owing to its close grain, mahogany is the better wood for mounting stereotypes, but as it is very expensive it has given place largely to cherry and cheaper woods.

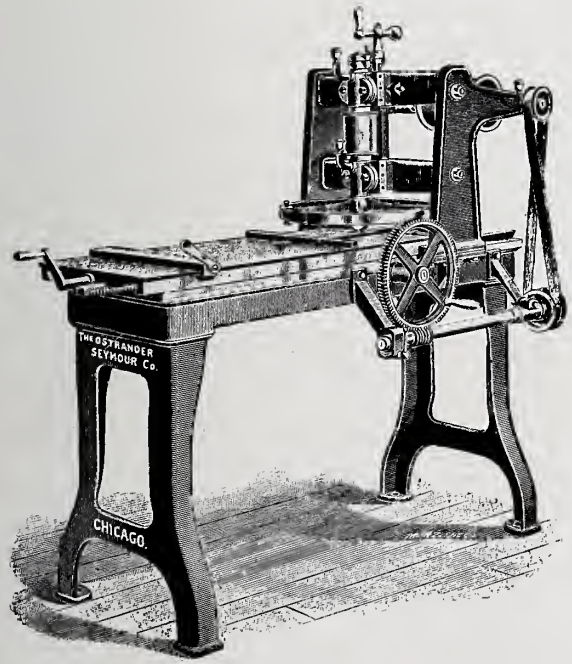
To prepare the wood for use, it must first be thoroughly dried by stacking it up for a sufficient length of time in a warm, dry atmosphere, or by drying it in a kiln. Wood which has been stacked in a yard under cover, in such a manner that the air has had free access to all its surfaces, is preferable to kiln-dried lumber, as it is much less liable to be affected by changes of atmosphere, but such lumber is exceedingly difficult to obtain, and as a rule the stereotyper finds it necessary to have his wood kiln-dried.

Having been dried, the lumber must be dressed in such a manner that its surfaces will be perfectly flat and parallel with each other. For this purpose the Daniels Planer is employed. Lumber which has been through the Nichols Dryer, or which has been otherwise dried so that it is perfectly flat, may be dressed by passing it through the shaving machine, but this is a tedious

process, as it is usually necessary to take off a number of cuts to reduce it to the proper thickness for blocking. The lumber may also, if perfectly flat, be dressed in a Pony Planer, but if warped or twisted, this machine is not suitable, for, while the lumber is flattened by the pressure rollers during the operation of planing, it immediately springs back to the original shape on being released. It is consequently more economical, and the results more satisfactory, to employ a Daniels Planer for this work, although the first cost of the machine might be considered excessive by small establishments. The peculiar advantage of this machine consists in the fact that the wood is always left perfectly flat and level, no matter how badly it may have been warped or sprung before planing. It is possible, therefore, to use lumber which would otherwise be wasted through inability to reduce it to a proper condition for blocking.

Referring to page 125 it will be observed that the cutting tools of the Daniels Planer are secured in a revolving disk which is vertically adjustable by means of the crank shown at the extreme top of the machine. Power is communicated to the disk by a belt passing over idlers, at the rear of the upright frame, to the pulley on the disk shaft. One of these idlers is secured to the shaft, which has on its outer end a grooved pulley, and thus provides a means of transmitting power to the worm shaft, shown at the side of the machine, which meshes with a worm wheel that is secured to a shaft which passes under the traveling bed and is provided on its inner end with a small pinion, which engages the rack attached to the under surface of the bed, thus communicating motion during the

operation of planing. By a simple mechanism which is at all times in control of the operator, the worm is thrown out of gear with the worm wheel, at the termination of the cut, and the bed returned to its first posi-



Daniels Planer.

tion by hand, for which purpose the worm wheel is provided with a handle. The lumber is held, during the operation of planing, between the jaws of the two serrated clamps, one of which may be set and locked at any point on the bed. The other clamp is provided with

a threaded extension which passes through a slot in the bed and is there connected with a screw extending the full length of the bed and terminating in the crank handle shown at the front of the machine. In operation the first clamp is put in proper position and locked, the board placed between the jaws and the second clamp drawn up to it by means of the crank mentioned. The board is thus securely held in its natural position, without springing or rocking, which on passing beneath the revolving cutter head has its upper surface made perfectly flat and level. The board is then turned over with its flat surface lying on the bed of the machine and again passed under the knives, which reduce it to the desired thickness. The cutter head is raised and lowered by a graduating adjusting screw operated by the crank shown at the top of the machine, and may be thus always returned to the proper height for the finishing cut without going to the trouble of comparing each board with a standard. The adjusting screw is also provided with a jamb nut which may be locked after the proper point has been determined, thereby preventing the disk from going below the desired distance from the bed of the machine. The cutting tools for the Daniels Planer, four in number, are of peculiar shape and require some care in grinding in order to preserve the original angles. The cutting nose of the tool is rounded and a knife edge obtained by hollow-grinding the end of the tool back from the point. The heel is raised high enough to provide ample clearance. Owing to the large size of the disk and the fact that the tool sockets are located near its periphery, the machine should be driven at a slow speed. Suppose the disk to

be eighteen inches in diameter and the cutting tools to be placed eight inches from the center, then the disk running at a speed of 1,500 revolutions would give to the cutters a travel of about 5,000 feet per minute, which is about all that a sharp-edged tool operating in hard wood can be made to stand, as the heat caused by the friction of a more rapid speed would draw the temper of the tools. After planing, the boards are cut into convenient lengths for handling and the plates secured to them by means of wire brads, if the cuts are small. If large, screws are employed in addition to the brads, with the object of preventing the block from warping and drawing away from the plate. Both brads and screws are driven through the thin places in the plate, i. e., the spaces. For the screws, holes must be drilled and countersunk, in order that the heads may be sufficiently depressed to avoid the danger of smutting the printed impression.

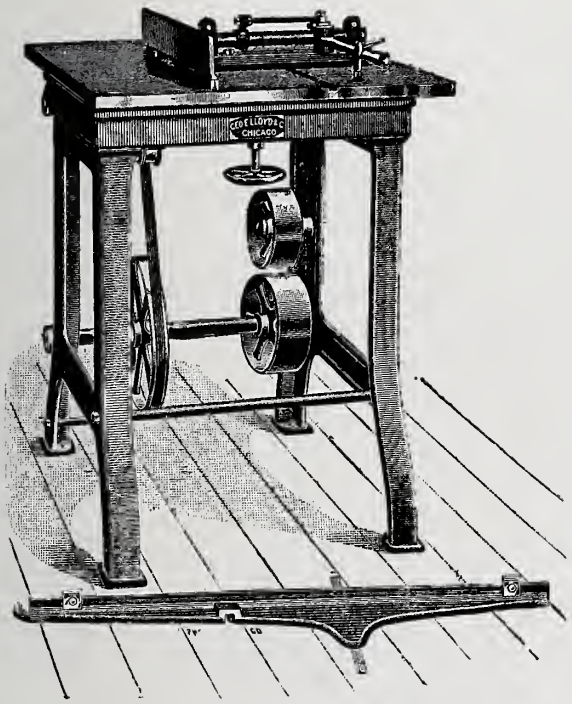
It is sometimes customary also to drill holes for the brads, and this is undoubtedly the safest course for the amateur, although an expert workman will usually drive the brad through the metal unless it is unusually thick. It sometimes happens that a plate will be found to have no spaces in which brads may be driven, as, for instance, a stereotyped engraving. In this case it becomes necessary to " anchor " the plate to the block. For this purpose holes about one-fourth of an inch in diameter are bored through the block and deeply countersunk on both sides. If the plate has been finished long enough to have become oxidized, the back is brightened by filing and it is then laid on the block and secured thereto by small hand clamps. It is then turned

over on its face and after a very small quantity of soldering fluid has been applied to the plate through the holes, melted solder is poured in until the holes are full. The plate is thus securely anchored to the block. It is important, of course, to have the solder not too hot, as in that case there would be danger of its melting through the plate. When a large number of small cuts are to be mounted, it is customary to tack them onto a board as large as may conveniently be planed, leaving sufficient room between to saw them apart. Should it be necessary to take a final shaving off from the bottom of the cuts, after they have been blocked, it may be done more conveniently if several are shaved at a time than if each one had to be handled separately.

Very large blocks are apt to warp, in time, in spite of all precautions that may be taken to prevent it, and to reduce this tendency to a minimum such blocks are made in sections, and are called "end blocks," because the ends of the blocks are made of strips of wood with the grain running across the grain of the main block. A crude way of making such blocks is to drill screw holes through the narrow strips, countersink them deeply, and after clamping the block and strips to a flat surface, drive the screws home. The blocks and strips are made of rough lumber, except that the ends of the block and the sides of the strips are finished square to secure a good joint. After they are screwed together the block is passed through the Daniels Planer, which corrects any unevenness due to careless or inaccurate work.

While such end blocks are preferable to a block having no protection against warping, they are inferior

to a block whose end strips are secured by means of a dovetailed mortise and tenon, for the screwed end strip is secured to the block at intervals only, while the dove-



Dovetailing Machine.

tailed strip has a continuous grip on the end of the block.

For the manufacture of such blocks a machine has been designed which rapidly and accurately fits the different sections. It is called a dovetailing and box

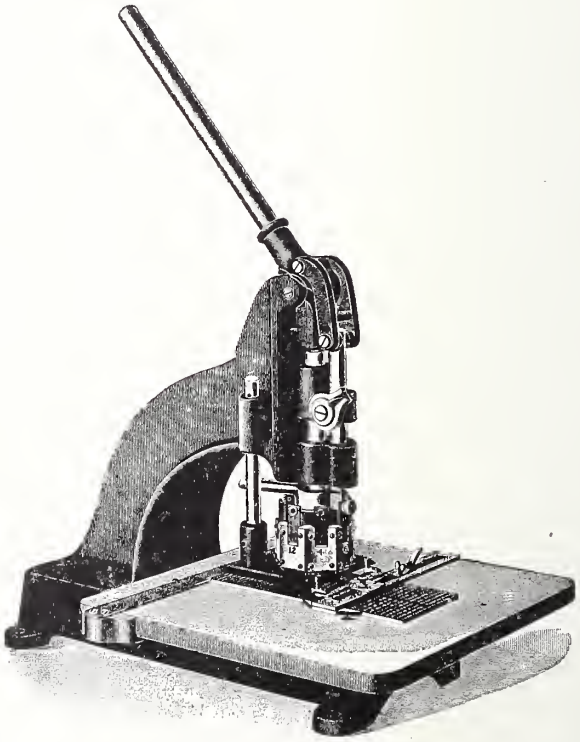
machine, and for large foundries is a convenient and desirable tool. The cutting tools are a thick gouge saw of about number three gage, which cuts a slot in the board or strip, and a vertical revolving cutter which follows in the slot and changes it to a dovetail groove. The mechanism for driving the saw and cutter is sufficiently explained by the engraving on page 129. The parallel side gage against which the board is pressed during the cutting of the dovetail can be instantly changed by means of the small lever at the right of the machine, so that either the center or the edge of the strip may be thrown in alignment with the cutters, thus providing a means for cutting the dovetailed groove in one board and a rabbet on another. The mechanism for changing the side gage from one position to the other is such that there can be no variation in the distance it is moved and whatever position it occupies it is automatically locked therein, thus insuring absolute uniformity of work. The machine may be readily adjusted to operate in lumber of different thicknesses, from one-half inch to one inch or more.

Book plates are seldom mounted on wooden blocks, as they can be more cheaply made and more satisfactorily "worked" on "patent blocks," with a supply of which every large book-publishing house is provided. "Patent blocks" are made of iron, finished one pica less than height of type and furnished with clamping devices, which secure the plate to the base. The best blocks are made in sections and may be readily made up to fit any size of plate. The clamps are beveled so as to overlap the beveled edge of the plate, and upon one side of the block are made adjustable so that by

Nailing Machine.

means of small-toothed wheels, operated by a rack, they may be snugly clamped against the edge of the plate.

In fastening thin stereotype plates to wood blocks it is necessary to nail them. This is ordinarily done by hand, but recently perfected nailing machines make the work more certain, rapid and free from the risk of



Mortising or Revising Machine.

injuring the plate through the slipping of a hammer in hand nailing.

Every stereotyping plant should possess a patent plate-mortising and correcting machine (also called a revising machine), for it is one of the most valuable time and labor saving machines ever brought out for stereotypers. It does away with hand-revising punches, calipers, gravers, etc. A series of variable sized punches are supported on a rotary holder. They can be brought under the plunger, which is operated by a hand lever. The die in the bed is adjustable so that all cuts will be clean and absolutely perpendicular, so that type can be set in with exactness at once, as no burs are formed. Suitable gages help to locate the exact point where the mortise is to be made. Openings that will accommodate type-bodies from 4 to 12 point, a single letter to an entire line, can be formed with a precision that is absolutely unattainable by means of hand punches. When more than one letter to a line has to be corrected the guide or locating gages insure exact alignment. Special punches can be made to fit the type-bodies of any country at a moderate cost.

APPENDIX.

AUTOPLATE, THE.— The Autoplate consists of combined casting and finishing mechanisms which coöperate to automatically cast, shave and trim at the head, foot and sides, and deliver ready for use, curved stereotype printing-plates at the rate of three and a half per minute. At one end of the machine is the casting mechanism in which the matrix is secured (the operation of securing the matrix occupies less time and may be done with more convenience than with the present hand-box). Once the matrix is in position, the operator, at the casting end of the machine, throws down the lever and the casting apparatus proceeds automatically to cast and deliver plates to the finishing mechanism which adjoins it. As each cast is ejected from the casting chamber it is automatically thrust into the finishing mechanism where, likewise automatically, it is trimmed, head, foot and sides, shaved out, its bevels finished and delivered ready for printing. If large blanks throughout the body of a matrix are not properly backed up they will have to be dressed out of the plates by hand, but all other finishing the machine takes care of. The Autoplate is so arranged that a change may be made from one matrix to another with the loss of but one casting operation; thus it is easy (and results in the loss of but a small fraction of a minute) to change from the casting of one page to that of another. It should be understood that the change of matrices, which requires the stoppage of casting, in no wise interferes with the operation of finishing all the plates that are in the machine at the time for the change. All the waste from finishing — sawdust, shavings and tails — goes into a receptacle, from which it may be removed with a shovel and thrown back into the furnace; thus all stereotype metal is

conserved and kept free from the floor dirt which is usually mixed with it. From three to four men only are necessary to the operation of the Autoplate machine — one to look after the casting end, another to look after the supply of metal, and the third or fourth to inspect the plates as they are delivered and lift them off the machine.

BACKING POWDER.— The following backing compounds are all good and are all patented: (1) Four parts lime, one part wheat flour. (2) Equal parts lime, wheat flour and plaster of paris, and one-sixteenth part alum. (3) Forty-three parts marble dust and seven parts wheat flour.

BEATING THE MATRIX.— It is better to strike a large number of light blows with the brush than a less number of heavy blows, for unless the operator is an expert, a heavy blow will be liable to split the flong and, moreover, light blows oft repeated will drive the flong into the bowls or counters of the types where depth of impression is most desired, while the heavy blow drives the flong down between the lines of type rather than into the bowls, thereby forming ridges on the face of the matrix.

BELTS, RULE FOR CALCULATING LENGTH OF.— Add the diameters of the two pulleys together, divide the result by two, and multiply the quotient by 3 1-7; then add this product to twice the distance between the center of the shafts.

BELTS SLIPPING.— A belt slips only when it gets too heavy a load to drive, or when it gets dry and out of condition. When a belt gets saturated with waste oil, an application of ground chalk will soon absorb the oil and make the belt workable. Belting having joints cemented only is quite as good as if the belt were formed of solid leather from end to end. It lasts much longer and drives better than when cut up with sewing. Belts running over pulleys of small diameter at high speed ought to be as thin and as wide as possible. Orange-tan leather of uniform thickness answers remarkably well. Thin belts, as wide as possible, give by far the best results working vertically. A thick vertical belt will not hug the pulleys.

BENDING A SMALL MATRIX.— Make your matrix soft, i. e., with a minimum quantity of glue, whiting or other stiffening, and depend on felt packing to hold your spaces. Pieces of heavy press blanket will answer, or you can procure a felt packing made especially for the purpose. The packing can be used several times, and when once cut to fit the blanks can be very quickly placed in position.

BLISTERED MATRICES.— Blistering indicates that there is too much water in your paste, that your paste is not sufficiently adhesive, or that it is not spread on the paper with sufficient care. In making matrices for molding half-tones, it is absolutely essential that the paper shall be thoroughly pasted. If any spots, however small, are left uncovered, the paper will separate and puff up. This sometimes happens when molding forms made up exclusively of type, but is much more likely on flat surfaces.

BLISTERING, CAUSE OF.— If flongs are properly made in the first place, the cause of their blistering will be found in the fact that the matrices are not thoroughly dried out before casting. If any moisture remains in the matrix it will be changed to steam by the heat of the metal and the layers of paper will be forced apart or raised up, "blistered," by the expansion. The molds should be dried as thoroughly as possible on the type and then laid on a hot surface for some time until the moisture has been entirely expelled.

BRUSH AND SIEVE.— The sieve and brush used in preparing the paste are manufactured specially for the purpose, the former being in the form of a basin with sieve bottom, secured in a wooden frame so that the sifted paste will fall into another basin underneath. The brush is circular in form, made of stiff bristles and provided with a handle to facilitate its operation. Both sieve and brush should be thoroughly washed as soon as possible after using, as it is no easy matter to clean them after the paste has dried.

BRUSHES, LEVELING STEREOTYPE BEATING.— The method most commonly employed is to touch the brush

lightly to a perfectly flat piece of nearly red-hot iron, then turn the brush end for end and touch it again, continuing the process until all the bristles are burned down to the same length. In England the brushes are usually returned to the manufacturers to be trimmed with shears, and this is undoubtedly the better method, for the reason that the burning process produces small knobs on the ends of the bristles, which naturally do not increase the efficiency of the brush.

CASTING LARGE PLATES.— After the matrix is molded, the form is covered with blankets in the usual way; we then have a ¾-inch-thick steel plate, long enough to cover form from end to end; then put under steam table, tightening down as usual. The eight inches or so which are outside of the platen are held down firmly by this steel plate, which, owing to its thickness, will not spring up, thus giving an even pressure on the entire form. The same idea is followed in the casting of the plate, two plates of ¼-inch thickness being employed, the bottom one, on which matrix is placed, being about forty-eight inches long. After the gages are put around matrix, the top plate, which is about three inches shorter than the bottom one, is put on. Now the box is closed and the fourteen inches or so extending out of the box proper are clamped together with four clamps to prevent the plates going apart as the metal is being poured in. Taking everything into consideration, the variation in thickness of the plate after casting is very slight. Of course, a little difficulty was experienced at first in casting such long, thin plates, the metal invariably getting chilled before it got to the bottom of the box, but at present we make as perfect plates of the "long fellow" as of anything else.

CELLULOID PRINTING-PLATES.— In some respects celluloid is a desirable material for printing-plates. It is hard and durable and is not affected by inks containing chemicals destructive to copper. Its plastic nature when warm insures perfect reproductions, and its light weight compared with metal plates makes it particularly valuable for the manufacture of plates which are to be shipped to distant points. These

merits were long ago recognized, and considerable time and money have been expended in experimenting with different methods of production. One of the difficulties in the way of the economical manufacture of celluloid plates has been the cost of the molds. When cement molds are employed, only one cast may be obtained from a mold. When copper molds are employed the cost is so high that the process is impracticable except where a large number of duplicates are required. Papier-maché molds have been used to some extent, but the tremendous pressure required to cast the celluloid soon distorts or destroys the mold. A new method of making the mold, as well as the plate of celluloid, has been somewhat recently invented in Denmark. It is claimed to be a practical and useful method, inexpensive and adapted to the needs of the average printer. Specimens exhibited by the inventor, and testimonials from reputable printers who have tested the plates, indicate that they possess exceptional merit. However, the celluloid compositions used are the inventor's secret, and may not be published. In the language of the inventor, "The proceeding is as follows: The matrix-celluloid is applied on and melted down the original at a certain degree of heat. After five minutes it is taken off, as a full ready matrix, in every way exactly as fine as the original. After this the cliche-celluloid is made plastic at a certain degree of heat, and, after having been cooled about two minutes, the cliche is ready to be used. Such cliches are to be stuck — not nailed — on a wooden block. Yet it is absolutely required by producing fine cliches that both kinds of celluloid have the exact properties wanted. The method offers many advantages, not only by its rapidity and surety, the cheapness of the material, the infinitely little cost of installment, but also by the fact that the material is always at hand without any preparing beforehand. The material may be kept at any place for years without depreciation. When the reproduction is to be made on a smaller scale and not in a manufactory way, consequently in printing-offices, the proceeding is so simple that any person is able to learn it in a couple of days, and the machine and other smaller appliances may be procured at a little amount."

CELLULOID MATRIX COMPOSITION (patented by Louis Ganen).—Peroxid of lead (red litharge) moistened with glycerin to the consistency of putty. It becomes hard as a stone in a few minutes and must be molded at just the right instant while it is setting. It will not stand more than one cast and it is doubtful if any cement can be made which will stand more.

CELLULOID, SUBSTITUTE FOR.—A consular report from Frieburg states that a new substance closely resembling celluloid has been produced by boiling untanned leather in oil. It has the property of being a good electrical insulator and can be used for many purposes. This new material, to which the inventor has given the name "marloid," can be polished on both sides, and in its structure resembles horn and can be pressed or worked into any form whatever, either directly after the boiling process or later, after the hardened hide has been made soft and elastic by being dipped into a salt or alum bath. By means of polishing, this material can be made almost transparent, and it can be given different degrees of hardness, so that a substance is obtained which can be kneaded, embossed, stamped, pressed, drawn and twisted into any desired shape, style or design.

CHALK PLATES.—"Air-holes and shrinking in stereotyping are caused from the irregular distribution of heat in the casting-box and irregularity of cooling. As the metal shrinks in cooling, the part that cools first is solid, and, in becoming so, takes up the metal from the places that are still liquid, and when these places cool they are more or less porous, as they had not the metal to draw from, as the other parts are set. On this theory, I made a casting-box out of two steel plates a quarter of an inch thick and put my chalk plates between them, making, as it were, an iron box. I heated both sides of the box alike to the temperature of the melted metal exactly. I then poured in the casting metal. When the box was full and stood without chilling, I took a sponge soaked in water and cooled the side the chalk plate was on, thus causing the metal to shrink to the plate before the other side got

chilled. It is almost impossible to get an even heat in one of those casting-boxes, and to undertake to cool one side off with water would undoubtedly cause it to crack. There is air and gas to contend with in stereotyping, but these gases will go out on the side that cools last. I have stereotyped plates from 1 inch to 12 by 16 inches by the above method, without the least flaw, and the printing surfaces have that brightness that characterizes the type of the best foundries."

CHALK-PLATE INGREDIENTS.— In the patent issued to Maurice Joyce in 1874, the inventor states that he uses a mixture of ground potter's clay and plaster of paris, nearly equal parts, moistened with water to the consistency of mortar; but ground soapstone, chalk or other material may be used instead. The material is spread on the metal plate and scraped down to any desired thickness.

CHALK PLATES, STEREOTYPING.— The one all-present trouble with stereotypers in casting chalk plates is the lack of sufficient amount of heat in the casting-box, chalk plate and stereotyping metal. Chalk-plate work is very different from papier-maché work, from the fact that the chalk plate itself will chill the metal, the steel being a good conductor of heat. It is necessary to heat the metal until it will immediately scorch a piece of paper thrust into it. The casting-box must be heated beyond the point of melted metal. This may be tested by placing a piece of metal on the box and heating it until it melts. When in the right condition, metal will run from the casting-box "like water from a duck's back." Holes, sunken portions or porous spots in a stereotype are generally caused by the contraction of the metal in cooling. As all cooling metal must of necessity contract, it is desirable to make the contraction occur where it will not cause any trouble. This is done by making the cast chill from the lower end first, and gradually extending to the upper end. This is accomplished either by placing the lower end of the box upon a wet rag and filling it from time to time with hot metal at the top, or simply by filling the top with hot metal. This latter operation is further benefited by thrusting a stick down into the hardening

cast and immediately filling the vacancy thus made with hot metal.

CLAY STEREOTYPING.— The clay process is seldom employed, for the reason that it is too slow for most of the purposes for which stereotyping is applicable, and is not satisfactory as a substitute for electrotyping. The composition used for molds consists of ground potter's clay, powdered soapstone and plaster of paris, thoroughly mixed with water to a consistency of soft putty. The mixture is spread evenly and smoothly on an iron plate, which is clamped securely to the head of an electrotyper's swinging-head press. The first impression in the clay is made with a piece of cotton between the form and the clay, to absorb the superfluous moisture and block out the general shape of the form. Two or three subsequent impressions are made without the cloth, each a little deeper than the last, by which time the composition has become nearly set. The plate is then removed from the press and floated in the metal-pot until all moisture has been expelled. A bent steel wire is then laid on the plate surrounding the mold on three sides and another iron plate laid on the wire to form a cover. The two plates separated by the wire with the mold between them are clamped together and metal poured in the open side. To prevent shrinkage, water is poured on the plates, beginning at the bottom and cooling gradually toward the top. The process demands considerable skill in the operator, particularly in molding, as the impressions must be made at just the right instant to insure good results.

CLAY STEREOTYPE PROCESS.— A writer in the *British Printer* describes a new process for making stereotype molds from "flong," which is said to be made of natural clay chemically treated. It is said also to be an improvement on the old blot-and-tissue method — more expeditious, cleanly, easily done, economical and effective in bringing out hair-lines sharply. The "flong" is sent out in a dry state by the inventors and dampened before using. The mold is obtained by pressure on an ordinary hand press or other machine and also by beating with a brush.

CLAY VS. PAPIER-MACHE STEREOTYPING.— Clay, which is employed for stereotype molds, is a combination of soapstone, kaolin and plaster of paris. While these materials are reduced to a very fine powder, yet there is always more or less fine grit remaining, and it is probable that the wear on the type from this cause is fully equal to the wear caused by beating a papier-maché flong into the type. With the papier-maché process, however, there is another element of danger to type in overheating, particularly when the forms are handled by a careless workman. The form should not be locked tighter than necessary to "lift," and the type should be further protected by strips of soft pine wood placed between the type and chase at one side and one end. Then if the type becomes sufficiently heated to cause expansion, the wood will yield to the squeeze, and, when the form is cooled, the type will contract to its original dimensions. If these precautions are observed, the papier-maché process of stereotyping will be no more likely to injure the type than the clay process.

COLD PROCESS STEREOTYPING.— There are at least four methods in present use: First, the dry process, elsewhere described; second, the Dalziel process; third, the Kahrs process, and, fourth, the Schreiner, the three latter being named for convenience after their inventors. The Dalziel process consists in spreading evenly on a sheet of matrix paper to the depth of about six points a composition the nature of which is not made public, but which resembles kaolin. When this composition has dried or set to the consistency of putty, an impression is taken on an electrotype molding press. The form with the mold attached is then placed on a warm table and allowed to become quite dry, when the mold is carefully removed and cast in the usual manner. This process is not sold outright, but licenses are sold and the composition supplied to printers or others who desire to use it. The Kahrs process is simpler and much quicker. By this method a composition (also secret) is applied to the paper with a brush, and, when partially dry, is beaten into the form in the same manner as a papier-maché flong. It is then immediately

stripped from the form and laid on a steam table or other hot surface to dry. It is cast in the same manner as a papier-maché mold. The results obtained are quite satisfactory and the outfit is inexpensive. The Schreiner process also consists of a coated paper, but the paper is prepared by the inventor and needs only to be moistened to make it ready for use.

CONCAVE STEREOTYPES.— There are several causes for concaved stereotypes. If the concave is in the matrix, it is probably caused by hard-drying blankets and insufficient squeeze on the steam table while the matrix is drying, or, if a very thin matrix is used, the pressure of the metal in casting will sometimes force down the spaces around the large type, or other black surface, to an extent suffieient to cause the center of the type to spring up slightly, thus forming a depression in the cast. If the matrix is not defective, the depression in the cast is caused by the shrinkage of the metal away from the matrix in cooling. This may be due to one or more of three causes. The metal may be too hot, or it may contain too much tin, or the casting-box may be tilted in the wrong direction, i. e., so that the pressure of the metal is against the back cover of the box instead of against the matrix. The casting-box should never be in a perpendicular position, but should lean a little in such a way that the matrix will be on the under side. The tendency will then be for the metal to shrink away from the cover rather than away from the matrix. Concave may be also caused by using different kinds of paper for the matrix and for the back. If the backing paper shrinks more than the matrix, it will draw away from the latter, causing distortion.

COPPER-PLATING CURVED STEREOTYPES.— It would be advisable to use a curved anode for this purpose, or else several small anodes suspended in such a manner that they will be equally distant from all parts of the surface of the curved plate. If a flat anode were employed, the deposit of copper would be thickest at the center of the plate, which would be nearest the anode, and the edges of the plate, which by reason of the curve would be separated a long distance from

the anode, would receive a very thin deposit. Copper is so easily and rapidly deposited in the acid copper bath (electrotypers' solution) that a current of very low tension should be employed, otherwise the deposit will not be smooth. A tension of one volt would be amply sufficient, and the anodes should be separated from the surface of the plate by a distance of four inches, or even more, if there is any tendency to roughness in the deposit. Under favorable conditions, a sufficiently heavy plating will be obtained in from twenty minutes to half an hour. As to the wearing qualities of a copper-faced stereotype, the Newton Copper Type Company claims that the durability of type is doubled by copper-facing, and its claim seems to be amply supported by the testimony of those who have used its product. It is probable, therefore, that the wearing quality of a stereotype would be increased to a similar extent by copper-facing.

CORRODED STEREOTYPE PLATES.— The American Encyclopedia states that, in a moist atmosphere, lead is covered with a thin film of oxid, which combines with carbonic acid gas absorbed from the air, forming with it a film of silky scales of hydrated oxycarbonate of lead. More lead is then oxidized, dissolved and converted into carbonate, and so the process of corrosion goes on. The carbonate can be removed by washing the plates with very dilute nitric acid and immediately rinsing in clean water.

COST OF STEREOTYPING.— The question is a broad one and is analogous to the question: What would it cost to build a house? In order to estimate on the latter proposition, it would be necessary to know the size of the house, the kind of material of which it is to be constructed, the cost of labor and material in the locality where it is proposed to build, and various other data. To estimate intelligently on the cost of stereotyping, it is also necessary that all the conditions shall be known. Some kinds of stereotyping cost more than others. There is a difference in the grades of metal used for different purposes, and a very decided difference in the cost of labor in different localities. Moreover, an outfit of machinery and appliances may cost anywhere from $100 to $3,000.

CURVED STEREOTYPE PLATE FINISHING MACHINE.— A machine has been recently patented which is designed to dispense with the tail-cutting machine, shaving machine and finishing block, which have heretofore been necessary to finish a stereotype plate, and to save the time and labor incident to transferring the plate to such machines. The machine is wholly automatic. A principal cylinder is provided for the mounting of the plate, and on this the curved plate is positioned and clamped, when the cylinder is set in motion and rotating beveled knives completely finish the top and bottom margins of the plate and determine its length by means of the grooves in which they work. The cylinder is then made to take a new motion, advancing lengthwise without rotating, and thus carrying the plate against cylindrical cutters which shave the side margins. When the side trim is accomplished, a rotary carrier revolves the plate one-half and places it face downward in a shaving box, where it is reduced to the proper thickness by the shaving of its inner surface. All that is required of the operator is to fix the plate on the cylinder and set the machine in operation by the depression of a foot lever. At the end of the trimming and shaving operations the plate is brought back to its first position on the cylinder and the machine comes to rest, when the operator may unclamp the plate and set another in its place.

DEFECTIVE STEREOTYPING.— Oven-dried molds are never so perfect as molds dried on the steam table, for the reason that by the latter process the mold is dried under pressure, in contact with the type, and is thereby prevented from shrinking or blistering. However, fairly good results may be obtained by the oven process when the pages to be stereotyped contain no illustrations, for, by observing proper precautions, the shrinkage may be minimized to a point where it will not materially affect type-faces. If there is moisture left in the matrix, the hot metal will convert it into steam, which causes the face of the matrix to puff up in small spots, thus producing corresponding depressions or shrinks in the head-letter or other flat surfaces. Molds dried separately from the type should be dried quickly to insure the best results.

DROSS.—"Dross" is the compound or compounds formed by the action of air upon molten metals. The oxygen contained in the atmosphere attacks most of the metals with which we are acquainted. The tarnishing of most metals when exposed to the air is well known by all. The compound formed in this way is an oxide of the metal. The formation of this oxide takes place more rapidly and in larger quantity the higher the temperature of the metal. In molten metals, high temperature and prolonged contact with the atmosphere lead to the rapid formation of "dross" or oxid, which is the name given to the scum which collects upon the surface of the metal. This oxidation only occurs upon the surface of the molten metal, where the air has access, and not in the center of the mass, at least not to any appreciable extent. It is therefore easy to skim this dross from the metal by means of an iron ladle, and it can then be reduced to metal. The principle of its reduction to the metallic state is this: If such dross is heated in contact with carbonaceous material, such as rosin, the carbon and reducing gases formed in the process take away the oxygen contained in the dross, liberating the metal. This simple process is typical of that used on a large scale to obtain metals from their combinations with oxygen.

DRY STEREOTYPING.—The flong is a thick, spongy paper which packs smoothly under pressure. The matrix is made by laying a sheet of dry paper on the form, covering it with a thin press blanket and a sheet of pressboard, and running it through a matrix-rolling machine. The matrix thus made is dusted with French chalk and immediately placed in the casting-box, no drying being necessary. The process is employed quite extensively in Germany and to a less extent in England, France and the United States. The essential feature of the dry stereotyping paper or flong is its porosity, which is produced in the following manner: The sheets of paper, consisting of vegetable fiber, are impregnated with a chemical fluid, which, being brought in contact with another liquid, gives rise to the development of gases. As these gases force their way from the interior of the sheet to the outside, they loosen the fiber, in consequence of which the paper becomes porous to a

high degree. For example, the plates may be first immersed in sodium carbonate and then in acid — for instance, vinegar — thereby developing carbonic acid gas, which effects the loosening of the plate. In this manner the porosity of the plate is obtained. The fiber is treated in a long seine machine in the same manner as roofpaper, care being taken to avoid all pressure on the material, in order to maintain the porosity. Finally the sheets are covered on one side with a thin layer of starch paste, to which about five per cent of glycerin has been added, to prevent, so far as possible, the adhesion of the metal to the fibrous material in casting. A German trade journal describes a new dry flong which, it is claimed, is superior to others in the respect that it possesses elasticity, pliability and firmness to a greater extent and therefore permits a deeper impression, smoother surface and will stand a greater number of casts. The pliability is obtained by the use of glycerin, white of egg and alcohol. A glue made from plants with the addition of whites of eggs is used to secure the different layers of paper together. To increase the strength and durability of the flong, soft gauze is soaked in gelatin and then interleaved with the sheets of paper of which the flong is composed. To prevent the flong from becoming hard, a small quantity of calcium chlorid is sprinkled over the paste-covered sheets. The calcium chlorid absorbs the moisture in the air and so keeps the flong damp and elastic.

DRYING BLANKETS, CARE OF.— Drying blankets should be washed frequently. It is a good plan to let them soak over night and then boil them. Do not use an all-wool blanket; a cotton warp will last longer.

DRYING STEREOTYPE MOLDS BY HOT AIR VS. STEAM.— Hot air will not injure type any more than steam heat, provided it is no hotter than steam. The chief advantage of the steam table lies in the fact that the heat is limited to a safe temperature, whereas with gas or coal as a heating agent there is great danger of overheating, because of the difficulty of controlling the heat within safe limits, and the further fact that it is impossible to determine the degree of heat to which

the type is being subjected. The steam table is, therefore, by far the safer method of drying molds. A sixteen-inch steam generator will supply all the steam necessary to heat one steam table. Whatever method is employed for drying, great care should be observed in looking up the forms, for even with the steam-table process there is danger of injuring the type unless provision is made for expansion.

DURABILITY OF STEREOTYPES.— The amount of wear which a stereotype plate will stand depends largely upon the quality of metal employed. In newspaper work it is not unusual to run fifty thousand impressions from one plate.

FLONG, A NEW STEREO.— The German *Allgemeiner Anzeiger* describes a new method of producing stereo flong, which will allow of dry stereotyping, meaning that the flong may be used in the condition in which the flong is sold, without damping or other treatment. There are, of course, other dry flongs on the market, but they are nearly all deficient in one or two points; either they will not allow of a perfectly flat or even impression, so as to give the resulting plate a smooth surface, or they will not allow of "beating" to the sufficient depth to allow of the plates being deep enough where there is no type to take impression. In order to do this properly, a flong must possess great elasticity, or perhaps pliability would be a better term. It must also be firm enough in texture to resist the pouring of the hot metal over it once or many times. The pliability of this new flong is insured by the addition to it of a suitable chemical, such as glycerin, white of egg and alcohol. In order to give the flong the necessary strength and durability to resist the beating and pressure, a certain piece of soft, absorbent, gauzy material is soaked in gelatin and then calendered. A special glue made from plants, with the addition of white of egg, etc., is used to fasten the different layers of paper together. When making flong for rotary machine plates, the addition of a little glycerin to the paste will give the molds the necessary elasticity to allow them to be bent into shape. In order to keep the flong from becoming hard, a very small quantity of calcium chlorid is sprinkled over

the paste-covered sheets. The calcium chlorid is hygroscopic and will absorb any moisture there may be in the air, and so keep the flong always damp and elastic.

FLONG PASTING MACHINE.—Improvements in stereotyping processes have been heretofore restricted for the most part to machinery employed in finishing the plates. So far as stereotyping proper is concerned, there has been little change in the methods which obtained thirty years ago. The flong is constructed now, as then, by pasting and superimposing by hand several sheets of suitable paper, and the matrix is formed by heating or rolling the flong into the type-form and drying it under pressure. Various machines have been devised to facilitate the operations of sawing, trimming, routing and beveling the plates, but no effort has been made to substitute machinery for handwork in the construction of flongs. Perhaps this is due to the fact that in newspaper offices this is the one detail of stereotyping in which saving of time would be of no special advantage, for the flongs are here prepared before the rush begins, when time and men are at a discount. But stereotyping is a growing industry and its field of usefulness has extended beyond the daily newspaper office. To such an extent has the business grown that in some establishments the time of three or four men is constantly employed in making flongs. To minimize this item of cost, the superintendent of a Chicago concern has recently invented a machine which takes the stereotype paper from rolls, pastes together the different sheets, rolls them smooth, and delivers the completed flong at the rate of six hundred feet per hour, which is equivalent to about two hundred and fifty flongs of the size of an average newspaper page. The machine consists of a number of brass rolls geared together and so arranged and adjusted that the distribution of paste may be absolutely uniform. Each set of rolls is connected with a small fountain, which is automatically supplied with paste from a large reservoir. After leaving the rolls, the flong runs on to a carrier which conveys it to a conveniently located table, where it is cut into desired lengths. It is found that the machine-made flongs are in no sense inferior to hand-made, while the cost of manufacturing is

reduced more than fifty per cent. The inventor has made application for a patent on the machine.

FLOORS FOR STEREOTYPE FOUNDRIES.— Floors should be wood, covered, if possible, with heavy sheet iron. Cement or brick floors are very objectionable, because more or less grit is swept up with the metal chips and finds it way into the metal-pot and, later, into the casts, where it dulls the saws and trimmer's tools used to finish the plates.

FRENCH CHALK.— While not absolutely necessary, the use of French chalk on the face of the matrix is of great value when a number of coats are wanted, its greasy nature facilitating the removal of the mold from the cast. The metal may be run a little cooler when French chalk is used than when it is not.

"FUDGE," THE.— This is an attachment to the rotary press, having its own ink fountain, rollers, etc., whereby single or double column latest news notes are printed in from Linotype lines and type direct. Fitted to a shaft are six two-column miniature "turtles." These are detachable and sent to the composing-room to be equipped. The modus operandi is perhaps best explained in detailing a scene in a composing-room while a league game is being played. At the end of the seventh inning the regular form is closed up, the major portion of a column left blank and the form sent to the stereotype-room to be molded and cast up as usual and placed on the press. If the make-up has been alert, the stereotyper will have plenty of time, for there are still two innings to hear from. As fast as the news from the ball field is ticked off and given to the machine operator, the lines are assembled by the make-up into the slightly curved, turtle-like "fudges," wedge-shaped brass leads being placed between each line. When the "fudge" is full, a few turns of the lineholder-like side-lock clamp secures the contents, and it is sent to the pressroom and placed in position on the "fudge" shaft as any plate would be on a cylinder. But while the diameter of a plate cylinder is usually fifteen inches, that of the "fudge" shaft is about six inches. In this manner the desired number

of "fudges" is completed, containing a complete account of the last two innings, with summary, tables, etc., the "fudge" contents printing in the blank portion purposely left for it in the form and plate. It is not an unusual thing to have papers on the street three minutes after the umpire has declared the last "out," with the stereotyper looking on complacently, for, while he has not been shorn of any of his work, he has been spared the heart-breaking finish known only too well to all newspaper workers.

HALF-TONES IN CURVED STEREOTYPE PLATES. — Various schemes have been suggested for casting or otherwise securing electrotypes or half-tones in the curved stereotype plates from which daily newspapers are printed. Perhaps the method most often employed is to remove the engraving from its base, after the matrix has been made, and curve it to a perfect segment. After the mold has been adjusted in the casting-box, the curved engraving is fitted in its place in the matrix. When the stereotype metal is poured into the casting-box, it surrounds and overflows the electrotype, securely embedding it in the cast. Another method consists in removing the engraving from its block before molding and filling in the depression in the back of the matrix caused by the absence of the engraving, with packing of exactly the same thickness as the electrotype. After the cast has been made, the electrotype may be curved and then tacked or soldered into the depression. Another method is to remove the half-tone from its base after the matrix has been made, and curve it, either by passing it through a curving machine or by placing it in the casting-box and closing the cover down upon it. After the matrix has been adjusted in the casting-box, the curved half-tone is fitted in its place in the matrix and a piece of corrugated tin or some strips of wood of proper thickness are laid on the back so that when the cover is closed down the engraving will be held securely in its place. When the metal is poured into the casting-box, it surrounds and imbeds the engraving in the plate.

HALF-TONES, STEREOTYPING. — Half-tones should be mounted exactly type-high; if made higher they will pre-

sent a smutty appearance in the paper. The writer prefers the special half-tone paper. This paper is soft and has a very short fiber. A good paste for half-tone work may be made as follows: 2½ pounds starch, ½ pound flour, 6 ounces dextrin, 2½ gallons water; cook in the usual manner. It is impossible to make a half-tone so deep that it will not fill up with the fuzz of cheap print paper combined with muddy ink. To work half-tones successfully requires care all along the line, not only in making the originals and the duplicates but in presswork and in the selection of paper and ink. B. & O. Myers, of New York, make a special grade of matrix paper for stereotyping half-tones, which is preferable to the usual quality, as it is a soft, short fiber which takes the shadings better than a harder paper. Half-tones do not require oiling; the matrix will stick to them better if the oiling is dispensed with. That is to say, the matrix will be less likely to puff up and double.

HARDENING AND TEMPERING STEEL.— Heat the steel to a bright cherry red and plunge it in water that has been thoroughly boiled and then allowed to cool. It will then be "as hard as fire and water will make it," and too hard for anything except hardened bearings or tools for cutting and drilling glass and very hard metals. To make it stand work without breaking it must be tempered. To do this, polish the surface on a grindstone or with emery paper, so that any change in the color of the metal may be easily seen. Then heat the tool until the cutting edge shows the proper color. Large drills and cold chisels are hardened and tempered at one operation, the cutting edge being cooled and hardened while the upper part is left out. When taken from the water the heat from the shank passes toward the cutting edge and brings it to the right degree of softness. Small drills have to be tempered in the flame of a lamp. A spirit lamp is best, and the neatest plan is to heat the drill a short distance from the point and allow the heat to flow toward the cutting edge. As soon as the right color is seen on the edge, the entire tool is plunged in water and cooled. In this way the shank is kept soft and the tool is not so apt to snap off.

HONEYCOMBED PLATES.— Honeycombed plates are caused by using metal too hard, or pouring the metal into a cold casting-box. If the metal is too hard, add a little lead. If a flat casting-box is used, paste a sheet of paper on the cover. Paper is a non-conductor and will prevent the metal from chilling, which is the cause of blow-holes.

IMPRESSION, DEPTH OF.— As the paper flong is beaten into the form, it becomes thin and the type shows dark through it. This color is also a guide to determine the evenness of the impression, for if the matrix is dark in one spot and light in another, it is evident that it is of uneven depth.

MATRIX PAPER, BEST WEIGHT.— To secure the best results with the least labor and expense, the matrix paper proper should weigh about forty pounds to the ream, size 20 by 24. A lighter paper would be found difficult to make up without tearing, and if much heavier it would require unnecessary labor to beat it into the form. The best weight for the second or backing sheet depends upon the material used for filling in the spaces or depressions in the back of the matrix. When "backing powder" is employed for this purpose, any common, medium-weight paper will answer for the back, for it does not require to be beaten into the form and can, therefore, be less tough and elastic than the first sheet. If, however, no backing powder or other filling material is used for packing the spaces, the backing paper should be about twice the weight of the first sheet, and should also be of fair quality.

MATRICES, PATTERN.— Some advertisers send out stereotype matrices of their announcements to publishers owning stereotyping outfits. This is an economical method of distribution and in some cases answers the purpose satisfactorily, provided the right kind of matrices are supplied. There are certain objections to the plan, however. In the first place, the use of matrices involves an extra remove from the original. When an electrotype is sent to a publisher whose forms are stereotyped, the printing is done, not from an electrotype, but from a stereotype of the electrotype. When a matrix is sent,

a stereotype is made from the matrix. This stereotype is then locked up in the form and again stereotyped for the press. Usually the first matrix is made from an electrotype pattern of the type, so that the actual printing-plate is four removes from the original type — first, the type; second, the electrotype pattern; third, the stereotype, and, fourth, the actual printing-plate. When the ad. is open, the type large, the matrix deep and sharp and the stereotyper painstaking, very little is lost in the reproductions, and the print is generally satisfactory. But, on the other hand, if the ad. is set in small, solid type, or if it contains half-tones of fine engravings, the result is apt to be disappointing and is certain to be so unless the matrices are hand-made and very deep and sharp. Machine matrices are unsuitable for such work, as they can not be made deep enough to insure a sharp stereotype pattern for the newspaper. An instance recently came to the writer's notice where an advertiser had a series of large display ads., containing etchings, set in a newspaper office with the object of saving the cost of electrotypes. The publisher was instructed to supply several other papers with matrices of the ads. The matrices were made by machine and were so shallow that the print in the papers using them was scarcely legible. The result was that the advertising was discontinued until ads. could be reset and electrotyped. In this case the ads. were of such a character that matrices might have been used to good advantage if they had been made with a brush, instead of by machine. Very often the country stereotyper is blamed for poor results when the trouble lies with the quality of the matrices supplied by the advertiser.

MATRIX WRINKLING UNDER THE ROLLER.— The machine is so constructed that the travel of the surface of the roller is the same speed as the bed. Adding the blanket to the roller increases its circumference and causes the blanket to crawl and with it the matrix. To overcome this fault, some stereotypers use a double thickness of blanket, as it is found that the upper blanket only will crawl, the lower one remaining stationary. Usually the wrinkling occurs when the chase is a little higher than the type, the matrix seeming to crawl

on the chase while held by the type. When the chase is a little lower than the type the trouble does not often occur.

METAL.— Stereotype metal is composed of lead, tin and antimony. The cheapest grade, however, contains little or no tin. For newspaper work, the proportions are about as follows: Lead, 75 per cent; tin, 8 per cent; antimony, 17 per cent. For bookwork: Lead, 80 per cent; antimony, 15 per cent; tin, 5 per cent. A still cheaper grade contains about 85 per cent lead and 15 per cent antimony. In mixing these metals, the antimony should be melted first. The lead should then be added, and, lastly, the tin. Stereotype metal fuses at about 630° F.

METAL, BRITTLE.— Mix pure lead with old stereotype metal until a strip of it poured out on an iron plate and cooled will bend considerably without breaking and the grain becomes fine and smooth. Do not mix electrotype metal, which contains too much tin and causes shrinks in cooling.

METAL, CLEANING.— Purifying metal is accomplished by immersing in the molten metal, in a suitable melting pot set over a furnace and provided with a hood or other means to carry away the smoke, a piece of green wood about four inches in diameter and seven or eight inches long. The green wood is attached to an iron rod in any suitable way. The metal must first be thoroughly melted, but must not be overheated. The green wood is then plunged into the molten metal, the door of the hood closed as much as possible, and the green wood allowed to remain in the metal about twenty minutes, or until the boiling ceases. This green wood is used to purify the molten metal. Great quantities of gas and vapor are evolved from green wood, the metal boils up violently, and the oxids contained in the interior of the molten metal are effectually reduced. After this operation, what remains of the green wood is removed and the metal is then thoroughly stirred and skimmed with an iron ladle. It is recommended to add a few ounces of resin to the molten metal before boiling out with green wood. This reduces the dross on the surface of the metal. Another method is as follows: Heat the metal to a temperature sufficient to brown without burning a piece

of thick white paper. Throw a little powdered rosin into the pot and stir constantly. A small piece of potato placed under the skimmer and held below the surface of the metal will cause the impurities to rise to the top, when they may be removed to the dross box.

METAL, "DOCTORING."— Stereotype metal sometimes separates; that is to say, the different ingredients become separated — not properly mixed. This condition is indicated by an extremely granular texture, and the remedy is remixing, which should be done by a practical man.

METAL, LINOTYPE.— Regarding the use of stereotype metal on Linotype machines, it is not to be recommended. Stereotype metal of the grade employed by the daily newspapers is too hard, and clogs the machines. The cheaper grades of stereo are sometimes used for Linotype, but are often the cause of annoyance. Linotype metal should be made of refined materials in exactly the right proportions to insure the best results.

METALS, MIXING.— It would not be safe to add old plate metal to newspaper metal. The platemakers buy only the cheapest grades of metal, which, while good enough for the purpose, would soon wear out if melted over and over every day.

METAL, "ROTTEN."— Add pure lead, a little at a time, until a strip when cool will bend to about a quarter circle before breaking. If plates are flat, without grooves in the back, paste a sheet of manila paper on the cover of casting-box, or lay a sheet over the gages after the matrix has been placed in the box, so that the metal will be poured between the matrix and the paper back. The paper is a non-conductor and prevents the metal from chilling too rapidly. If casting-box cover is grooved, paint it with a mixture of lampblack and tobacco in water. The mixture should be boiled for some time.

METAL, SUBSTITUTE FOR STEREOTYPE.— A composition for stereotyping has been recently invented for which superior merit is claimed. The material is called "flintine."

It is apparently of the nature of celluloid, but the inventor claims it can be restereotyped without injury. The cost of the material is only about one-third that of celluloid.

METAL, TEMPERATURE OF.— If the matrix is dry and the casting-box hot, the metal may be poured quite cool; that is, at a temperature just above the melting point. At this temperature better results will be obtained and less shrinkage observed than when the metal is too hot. A temperature anywhere between 280° to 295° C., or 536° to 563° F., has been shown to give excellent results. In order to determine the temperature, a thermometer is used which can be read up to about 600°, the bulb being plunged into the molten metal and readings taken when the mercury-level remains constant. Before plunging the thermometer into the metal it should be held about an inch above the hot metal, so as to gradually heat it. It is held in this position for a few moments, and, when it is found that the bulb is hot enough, the thermometer is immersed in the molten metal. Where no thermometers are at hand, the proper temperature of casting may be regulated approximately as follows: Plunge a piece of matrix or manila paper into the molten metal. If it turns brown, the metal will be in the right condition to cast from. A slight color imparted to the paper shows that the temperature of the metal is too low, while a very deep brown or black color shows the same to be too high.

MOLDING BY PRESSURE.— Many attempts have been made to produce stereotype molds by direct pressure, as, for instance, by means of a hydraulic or toggle press, in the same manner that stereotype molds in clay are made, but, so far as the writer has knowledge, such attempts have always resulted in failure, owing to the nature of the material employed. To produce a mold successfully by such means, the material must be plastic, like clay, wax or ozokerite.

NEGATIVE STEREOTYPES.— Some fine specimens of negative stereotypes have recently been produced by Mr. A. Kerefting, Ruhrart-am-Main, Germany. In his description of the process he calls attention to the fact that not every sort of

type or ornament is suitable for the purpose. Type with narrow faces should be avoided, as they do not give a fine negative effect. In the manufacture of negative stereotypes, the following materials are required: (1) ink, (2) cardboard, (3) negative powder, (4) alcohol. Pure job ink should be used, such as is to be found in every printing-office. The cardboard must be of a kind which, when moistened on one side with spirit, immediately sucks it up and shows through on the other side. The cardboard is the soul of the matrix and in ninety-nine cases out of a hundred is to be blamed for failure to obtain satisfactory plates. Postal cardboard is best for this purpose, but a sample should always be tested with the spirit before purchasing. Further, the cardboard must be perfectly smooth, for every rough spot will show in the casting of the plate. It would be advisable to try different kinds of cardboard until the one best suited for the purpose is found. The negative powder consists of finely sifted dextrin, one per cent naphthalin and two per cent manganese. Any one can make the powder for his own use. The powder must be protected from moisture. Use the common alcohol. It is recommended that one per cent spirit varnish be added to it. For making a negative plate an impression must first be taken on the cardboard of the type-form selected for the purpose. Fat and large type and block ornaments require considerable ink; on smaller and leaner type a less quantity will suffice. The fresh impression is then powdered with the negative powder and the superfluous powder removed by knocking on the back of the cardboard. It is well also to blow vigorously on the card to remove any powder which may be left. Now pour some of the spirit on a plate and place the card on it, back down. The spirit at once saturates the cardboard and colors all the powdered parts black. The wet matrix is then hardened by pressing the back of the card on a hot plate. The powdered parts will then swell up and become plastic and hard. When the powder takes the shining gray color of enamel the right degree of hardening has been reached and the matrix is ready for casting. Too much heating will destroy the adhesive power of the powder. In casting, care must be observed not to use

the metal too hot, which would result in melting the powder and spoiling the matrix.

NEW STEREOTYPING PROCESS.—A circular from the Skandinavisk Exprestypi Company, Copenhagen, Denmark, announces the production of a perfected process for making cuts from all descriptions of types or plates. The work, it is said, can be done in a few minutes by the printer without recourse to the stereotyper or electrotyper. A plastic mass is prepared, the basis of which it would appear is celluloid, and from this, it is said, the first cut can be made in about fifteen minutes, and each succeeding cut in five minutes. The material of which the cuts are made being a chemical substance, no planing or drilling is necessary, the edges only being required to be cut, and they can be then fixed directly on the block by an adhesive substance, which is a part of the process. In fact, everything that would seem to be desirable in a cut is effected by this process, so it is said. The machine for the proceeding occupies only a small space and demands no auxiliary apparatus of any kind. Specimens of the work from half-tone plates look very well and testimonials are offered from prominent printing firms in Denmark.

NICKELLO PROCESS OF STEREOTYPING.—A new process of stereotyping called "Nickello" is said to be superior to all other methods in present use. The essential feature of the new process consists in a pasty composition which is applied to the surface of the paper and which, when partially set, is pressed directly on to the face of the form. This composition differs from other composition in the respect that while it becomes hard and smooth as porcelain, yet it maintains the flexibility of the ordinary papier-maché matrix, and may be curved to cast plates for rotary presses. The material is analogous to wax, but practically any number of casts may be taken from the same matrix if reasonable care is exercised in handling. The plates produced by this method are said to be quite as good as electrotypes. The flong may be beaten in with a brush, but the rolling machine is recommended as being more rapid and giving more perfect results. The matrix

may be dried on the steam table in the usual manner, or by the use of a special apparatus it may be dried from the top, thus eliminating all danger of injury to type or cuts. The casting is performed in exactly similar manner to the ordinary process and with the same appliances. The paste will keep fresh for a considerable time and the matrices may be stored for an indefinite period. The metal may be used harder and hotter than ordinary stereotype metal, which insures a sharp and perfect impression. By giving these stereotypes a nickel facing they will endure for a quarter of a million impressions. All of the above advantages are claimed by the inventor and practical tests are now being made by a well-known concern.

NICKEL-PLATING STEREOTYPES.— Nickel will adhere firmly only to surfaces which are absolutely clean and free from oxid. If the plates are old and dirty or greasy, they should first be scrubbed in hot lye, then rinsed in clean water, then scrubbed with powdered pumice stone and rinsed again, after which they should be dipped for an instant in water acidulated with nitric acid in the proportion of about two ounces of acid to each gallon of water. After another rinsing, the plates should be immediately placed in the bath. It is important that no time be lost between the last rinsing and the immersion in the bath, for a film of oxid forms almost instantly on exposure to the air. If the plates are new and clean, the preliminary cleaning may be dispensed with, but they should be dipped for a few seconds in the acid and water to remove the oxid, and thoroughly rinsed in running water.

OILING MACHINERY.— It is a fact not generally known that too much oil is almost as bad as not enough for fast-running machinery. A drop of oil would run a router spindle ten hours if it were not stopped. But if it were stopped it would need another drop before starting. Use oil sparingly but frequently.

PACKING MATERIAL.— The material used for packing the spaces may be pieces of old matrices, strawboard or felt paper manufactured for the purpose, a putty made of marble dust and paste, or, better than these, a compound in the form

of powder, which may be readily sprcad over the matrix. These backing compounds may be procured of dealers in stereotypers' supplies, or may be manufactured by the workmen. The ingredients employed are usually lime and flour, intimately mixed and sifted, which, when moistened by the steam arising from the form and matrix and the subsequent drying, become a cement hard as stone. As few stereotypers have the necessary facilities for mixing the materials properly, it is usually cheaper and much more convenient and satisfactory to purchase the prepared compound.

PASTE.— It is possible to make stereotypes from a flour matrix, but much better results are obtained from matrices made with a paste which contains in propcr proportions glue, starch and whiting or other filler. Flour alone soaks into the paper, making the flong hard and lifeless. With such a flong it is difficult to obtain sufficient depth of impression in the bowls of the type, and unless made very shallow such a matrix would be likely to tear out in casting. The addition of a little cheap glue keeps the paste more on the surface of the paper and gives it a certain sponginess. This effect is increased by the addition of whiting, which also gives body to the flong, a smooth and rounded appearance to the spaces between the letters, makes the flong easy to mold, assures a deep bowl and facilitates rapid drying. Starch gives a smooth and glossy finish to the mold and thereby to the stereotype which may be cast from it.

PASTE, CARE OF.— Pastes should be kept in a covered jar when not in use; if cxposed to the air they become sour and moldy, which affects their adhesive quality. A little carbolic acid added when cooking will prevent fermentation.

PASTE, COOKING.— While paste should never be overcooked, yet it is important that it should be cooked thoroughly, that is, the entire quantity should come to a boil. In a steam-jacketed kettle, the mixture will boil first around the edges of the kettle; hence, to insure thorough cooking, it should be allowed to boil three or four minutes aftcr the first indications of boiling are seen. Whether the paste is cookcd by a steam

jet or in a steam kettle, it should be stirred continually, both to prevent lumping and to insure thorough mixture and assimilation of the materials. When cool, the paste should be of the consistency of thick cream. If too thick to spread easily, a little water may be added, but it is not advisable to add more than a small quantity, as the adhesiveness of the paste will be thereby impaired.

PASTE FOR BRUSH MATS.— Mix together 6 pounds Oswego starch, 4 pounds flour and 1 ounce of powdered alum, in 5 gallons of water; then add 1½ pounds of glue previously dissolved in 1 gallon of water. Cook until it boils thick. When cold, add 3 ounces of whiting to each pound of paste, mixing only a sufficient quantity for the day's use.

PASTE FOR ROLLER MACHINE.— Three pounds best wheat flour (strong, not pastry) and 4 quarts of water. Mix until all lumps are out of flour. Have this in one pan. In another pan: 12 ounces of starch and 3 ounces of carbolic acid and 2 quarts of water. Now stir until acid and starch are dissolved. Mix contents of both pans all together, and boil until paste will run in a string from stirring stick. When cool keep in a stone crock. This is a stock paste to be used from to make the two kinds of paste below: For Back Paste.— Take 2 pounds of the above stock paste and 5 ounces of whiting and 2 ounces of dextrin. Mix all together well; add water to thin enough to suit, then sieve and use. For Face or Tissue Paper.— Take 2 pounds of the above stock paste and 2 ounces of whiting. Mix whiting and paste; add water to thin; run through sieve and use. If face of tissues does not stick well, use gum-water to thin face paste. To make gum-water use 2 ounces of gum arabic to 1 quart of water; when gum is dissolved, it is ready for use.

PASTE FOR ROLLER MATRICES.— A good paste for roller matrices is made as follows: Mix 15 pounds of white dextrin, 10 pounds of bolted whiting and 5 pounds of Oswego starch in 22 quarts of water. Stir with the hands until all lumps have disappeared and then cook in a steam-jacketed kettle. The paste should boil slowly, with constant stirring,

for about ten or fifteen minutes. In warm weather a tablespoonful of carbolic acid may be added to prevent fermentation. Another recipe is: Starch, 1½ pounds; gilders' whiting, 2½ pounds; dextrin, 3¼ pounds. Dissolve dextrin in water and add starch as above. Cook in a steam-jacketed kettle.

PASTE KETTLE.— Paste is sometimes cooked by introducing steam directly into the vessel containing the materials. In this case some of the steam is condensed and adds to the quantity of water in the paste. It is obvious that when paste is cooked in this way less water will be required than when it is cooked over a fire by means of a water bath. How much less depends on the dryness of the steam used. This is a point not easily determined, and it is more satisfactory, therefore, to do the cooking over a gas stove, unless a large quantity is required, in which case a copper kettle surrounded by a steam jacket will be found convenient.

PASTE MATERIALS.— A great variety of materials is used by different stereotypers in the manufacture of paste, among which may be mentioned wheat flour, rye flour, farina, corn starch, potato starch, arrow root, glue, gelatin, gum arabic, gum acacia, dextrin, china clay, kaolin, paris white, barytes, ocher, litharge and zinc white.

PASTE, TO PRESERVE.— To preserve paste from fermentation, alum, carbolic acid, oxalic acid or essential oils are employed. When the mineral ingredient of the paste is added after the paste is cooked and cooled, alum is found to be the best preservative, but when the whiting or other filler is cooked with the paste, carbolic acid should be employed, because alum in combination with an alkali in water creates a chemical disturbance which impairs the adhesiveness of the paste.

PASTE RECIPES.— The following formula is employed by the writer with satisfactory results: 2½ pounds starch, ½ pound flour, 6 ounces dextrin, 2½ gallons water. Cook in a steam-jacketed kettle if possible. Here is another: Mix together with the hands until all lumps are dissolved 6½ pounds of Oswego starch and 2½ pounds of wheat flour, in 6 gallons of water. Then add 12 ounces of common glue, which

has been previously dissolved in 2 quarts of water, and 2 ounces of powdered alum. Cook until the mixture boils thick. When cold, take out a quantity sufficient for one day's use and add one-half its bulk of bolted whiting. The whiting should be thoroughly incorporated with the paste and the resultant mass forced through a sieve having about twenty meshes to the inch. Stir continuously while cooking. The following paste recipe is recommended by a writer in the *British Printer:* "Dextrin, 1 pound; flour, ½ pound; starch, 1 pound; glue, ½ pound; whiting, 2 pounds; water, 5 quarts, and a few drops of carbolic acid. First dissolve the dextrin in about a quart of boiling water, stirring until a stiff gummy solution is obtained. Having made the starch into a paste by the addition of cold water, the resulting thick liquid is poured into the dextrin while it is still in the boiling water. The paste and dextrin together should thicken almost immediately; stir well, and, after a short time, treat the flour exactly as the starch, and add to the compound in a cold state. It will be necessary here to allow for the maintenance of heat, but remember that too much heat will burn the mixture. If boiled over a Bunsen burner, the degree of heat may be easily regulated if desired. Having arrived so far, add the glue — soaked over night and reduced to a thick liquid form — and continue stirring process. The whiting is next taken in hand; this is crushed to a fine powder and, by the addition of cold water, converted to a thick paste, then in its turn added to the ingredients in the pot. The carbolic acid is added last."

PLASTER STEREOTYPING.— The composition used for making molds in the plaster process of stereotyping is plaster of paris of good quality. Forms which are to be duplicated by the plaster process must be set with high quads and spaces. A "molding frame" is set over the type, and the plaster, mixed to about the consistency of cream, is poured into the frame and worked down into the type with the hands, and finally scraped off with a straight-edge level with the top of the molding frame. After standing about fifteen minutes, the frame containing the plaster mold will be lifted off the form and placed in an oven to dry, which may require thirty minutes.

When thoroughly baked it is placed in a covered iron pan and immersed in the molten metal, which runs through holes in the corner of the pan and fills the mold. This operation requires about ten minutes. The cast is then removed to the cooling trough, when twenty minutes more are required to chill it. All of these operations must be conducted with great care and skill or the stereotype will be defective, and in any event considerable "picking" and finishing will be found necessary.

POLISHING MACHINERY.—Take a bottle of benzin and put in it a small chunk of paraffin. It will have to set a day or so, as the paraffin dissolves slowly. When a piece of iron is wiped with this the polish will remain for "good." Among machinists it is recognized as the best protection for polished iron. Machinery supply houses sell it as a secret preparation, advertised as "a volatile oil which evaporates, leaving a colorless and permanent coating."

PULLEYS, RULE FOR CALCULATING SPEED OF.—Problem 1: The diameter of the driver and the driven being given, to find the number of revolutions of the driven. Rule: Multiply the diameter of the driver by its number of revolutions and divide the product by the diameter of the driven. The quotient will be the number of revolutions. Problem 2: The diameter and revolutions of the driver being given, to find the diameter of the driven, that shall make any given number of revolutions in the same time. Rule: Multiply the diameter of the driver by its number of revolutions and divide the product by the number of revolutions of the driven; the quotient will be the diameter. Problem 3: To find the size of the driver. Rule: Multiply the diameter of the driver by the number of revolutions you wish to make, and divide the product by the revolutions of the driven; the quotient will be the size of the driver.

SHRINKS IN STEREOTYPE PLATES.—Nearly all kinds of metal are expanded by heat and contracted by cold. Naturally it contracts first where it cools first, which in the case of a stereotype plate is on the matrix side of the cast,

because the iron cover of the casting-box retains the heat on the back of the cast longer than the paper matrix on the face. Obviously, the way to force the shrinkage to the back of the cast where it will do no harm, is to cool the back of the plate first, which may be done by spraying the casting-box cover with water immediately after pouring the cast. The desired object will be more readily attained if the casting-box be tilted a little beyond the perpendicular when pouring. That is to say, it should lean slightly toward the furnace rather than away from it. If the metal is right to begin with and these instructions are followed, perfect casts should be obtained. It does not necessarily follow that because metal is new, good casts will result. Stereotype metal must be correctly proportioned or trouble will ensue whether the metal be old or new.

STEAM GENERATOR.— A generator, to produce satisfactory results, should be located under the steam table, so that the steam will circulate as it does in a house-heating plant. It would be difficult to heat a building with the steam plant located in the attic, and it is almost equally difficult to heat a steam table with the boiler on a higher plane than the table, for the reason that the water in the boiler frequently siphons into the table, and it is impracticable to trap it back into the boiler. On the other hand, if the boiler can be located on a floor below that on which the steam table stands, or if the generator is small enough to be located directly under the steam table, so that a perfect circulation may be assured, there would be no trouble in obtaining all the heat required. Steam generators of the latter description are now made specially for steam tables and are fully guaranteed by the makers.

STEAM TABLES, HEATING.— The only practical method of heating a drying table is by steam. Some of the manufacturers of stereotyping machinery furnish a small steam generator for this purpose, which occupies little space and is very satisfactory. Either coal or gas may be used for fuel. The drying table should be supplied with a small automatic trap to keep the table free from water without wasting steam. If the generator can be located on a floor below the drying

table, a trap would not be necessary, as the steam will circulate and prevent the accumulation of water in the table.

STEREOTYPING MACHINE.—A recent invention is described as a "machine for impressing and drying stereotype matrices." It differs from the methods ordinarily employed in the respects that neither brush nor roller are used to produce the impression. The peculiarity of the invention is found in the fact that the mold is made by direct pressure which is not exerted all over the form at the same time, but is brought to bear first on the center of the form and then on the outer portions, working from the center out to the edges, thus gradually expelling the air from under the flong. The platen of the machine is made of sections, the central platen being depressed first, then the sections immediately adjacent to the middle sections are depressed, and the pressure gradually extended until a perfectly clear impression of the entire body of the type has been obtained. After the several platen sections have all been brought in operation the pressure thereon is maintained by stopping the rotary movement of the cylinder over the platen until the impression has set or until the matrix is dried. The drying is accomplished by steam heat, the bed of the machine being cast hollow and heated in the same manner as an ordinary steam-table. As the form is not moved until the matrix is dry, all danger of doubling the matrix is eliminated.

TABULAR WORK, STEREOTYPING.—Unusual care should be exercised in locking up jobs of this description, and even then it is not always possible to prevent rules from working up. The same difficulty often occurs when printing such jobs from type, that is to say, the rules work up on the press just as they do under a brush. The remedy is to lock up the form as carefully as possible, then, if the rules persist in coming up, lift the matrix carefully from the high rule and plane it down, observing great care, of course, to get the matrix back properly. The beating should be done lightly; not less than four tissues should be used on the matrix, and it would do no harm to use five or six. The beating and planing

should be done very lightly, to avoid cutting the flong with the sharp points and rules, and for the same reason a soft drying blanket should be used. Severe beating or excessive pressure on the drying table, particularly if the blankets are hard, would force the points into the matrix deeper than the type, and cause them to be high in the stereotype plate.

SOLDERING ACID.— In mixing soldering acid, always use new, clean zinc clippings, and keep the basin and brush clean. Wash them every day and put in clean acid every morning.

TISSUES THAT DO NOT ADHERE.— Use plenty of filler, namely, whiting, in your paste, and a soft drying blanket. If you mold with a beating brush, do not pound the spaces more than necessary, but rely on your blankets to force them down. The separation is caused by the water in the paste turning to steam, which expands and forces the tissues apart. By using plenty of whiting, the moisture is partially absorbed and the soft drying blanket stretches the paper tight and prevents it from puffing. When high quads and spaces are used this trouble never occurs, because the matrix is forced down to the quads and held there by the blankets. In the absence of high quads the blankets must be relied upon to stretch the paper to an extent sufficient to prevent separation. When a large number of casts are required, or when the spaces are very large, it will pay to partially fill the spaces with pieces of leads or slugs, so as to provide a contact surface for the matrix. Pieces of strawboard will answer instead of slugs, but a metallic surface is better.

TYPE FORMS, OILING.— To prevent the flong from sticking to the form, brush the type sparingly with thin, clean headlight oil. A thick oil will bake on the types, causing them to stick together.

TYPE, GROWING.— This is an old trouble and one that has been experienced by many printers and stereotypers. The cause is found in the fact that metal expands with heat. The type is usually locked up tightly in a heavy steel chase, which

prevents expansion in a lateral direction, and, when heat is applied to dry the matrix, the expansion takes a vertical direction. The remedy lies in providing room in the chase for natural expansion. When this is done the type will expand equally in all directions, and, in cooling, will contract again to its original dimensions. A simple method of accomplishing this result is to surround the type with strips of soft wood, or at least to place a strip of wood between the side-sticks and the chase, and between the foot-stick and the type. The wood takes the squeeze of the expansion and relieves the type from excessive pressure. Forms which are to be stereotyped should never be locked tightly. It is a good plan to loosen the screws after the form is on the steam table. The writer has seen a heavy cast-iron, type-high chase, 2½ inches wide, broken apart by the tremendous power of expanding type. It is not strange, therefore, that type should be injured when subjected to such a strain, with no provision to take care of the expansion. It should be remembered that expansion is greater at a high than at a low temperature. Unless absolutely necessary to dry the matrix as rapidly as possible, as is the case with some newspaper pages, excessive heat should not be applied. A little care in this direction will add to the life of the type. Thirty or forty pounds steam pressure on the table will not be nearly so likely to cause injury as eighty or one hundred pounds.

TYPE SHORTENED BY STEREOTYPING.—Why type should become shortened by stereotyping is a conundrum which has never been satisfactorily solved, but there is no question as to the fact that it is sometimes so affected. The natural effect of stereotyping is to elongate the type, the heat of the drying press causing it to expand, but this danger may be minimized by observing proper precautions in locking up the form. The same precautions would no doubt be beneficial to type which shows a tendency to shorten under the influence of heat, but it is probable that no amount of care would save this particular dress of type. The writer, during an experience of many years, has learned that, while type from one foundry may be stereotyped thousands of times without per-

ceptible injury, an outfit from another foundry would be ruined in a few days or weeks, although the conditions governing the tests were identical. It is also a fact that type from one foundry will be shortened while another make of type will become elongated by continuous stereotyping. The inference from these facts is that different metal formulas are used by different typefoundries, and that all are not equally suitable for the manufacture of type which is to be stereotyped. It is certainly possible to stereotype from some makes of type without injury, provided the forms are not overheated or locked too tightly. The writer has stereotyped the same type over two thousand times without producing any change in its height. Of course, due care was exercised in locking up the forms, but it is also true that the metal in the type was of superior quality.

WOOD-MOUNTED CUTS.— If the form to be molded contains wood-mounted electrotypes, they should be underlaid with hard, thin card until they stand at least a thin lead higher than the type. The heat and pressure incident to molding shrink the block.

ZINC IN STEREOTYPE METAL.— T. B. Look, Portland, Maine, offers the following suggestions: "Zinc is about the worst thing that can get into metal. I found that it could be worked fairly well by the following treatment: Heat the metal very hot and allow the zinc (which is the lightest) to come to the surface as much as possible; then throw on with a scattering motion, so as to cover as much of the surface of metal as possible, a mixture of about three parts sulphur to one part powdered resin; now burn off with oil and skim thoroughly. Then repeat and add a small quantity of antimony to the metal. I used this method for five or six years where we sawed both stereotype and zinc with the same saw and melting the sawdust in with the metal. Although we used our metal on jobwork and cuts and half-tones, we never threw away a pound of metal."

INDEX.

BOOKS AND UTILITIES

Published or For Sale by

The Inland Printer Company

120-130 Sherman Street, Chicago
116 Nassau Street, New York

BOOKBINDING

Bookbinding — Paul N. Hasluck	$0.54
Bookbinding and the Care of Books — Douglas Cockerell	1.35
Bookbinding for Amateurs — W. J. E. Crane	1.10
Manual of the Art of Bookbinding — J. B. Nicholson	2.35
The Art of Bookbinding — J. W. Zachnsdorf	1.60

COMPOSING-ROOM

Concerning Type — A. S. Carnell	$ .50
Correct Composition — Theodore Low De Vinne	2.10
Covers and Title Pages in Various Color Combinations on Different Stocks — An Interesting Showing of Artistic Designs — Full of Suggestions	.75
Imposition, a Handbook for Printers — F. J. Trezise	1.00
Impressions of Modern Type Designs	.25
Modern Book Composition — Theodore Low De Vinne	2.10
Plain Printing Types — Theodore Low De Vinne	2.10
The Practical Printer — H. G. Bishop	1.00
Printing — Charles Thomas Jacobi	2.60
Printing and Writing Materials — Adèle Millicent Smith	1.60
Specimen Books:	
Bill-heads	.25
Envelope Corner-cards	.25
Letter-heads	.50
Professional Cards and Tickets	.25
Programs and Menus	.50
Covers and Title Pages	.75
The Stoneman — Charles W. Lee	1.00
Title-pages — Theodore Low De Vinne	2.10
Vest-pocket Manual of Printing	.50

DRAWING AND ILLUSTRATION

A Handbook of Ornament — Franz Sales Meyer.....$3.75
A Handbook of Plant Form..... 2.60
Alphabets — A Handbook of Lettering — Edward F. Strange..... 1.60
Alphabets Old and New — Lewis F. Day..... 1.35
Decorative Designs — Paul N. Hasluck..... .54
Drawing for Printers — Ernest Knaufft..... 2.00
Drawing for Reproduction — Charles G. Harper..... 2.35
Human Figure — J. H. Vanderpoel..... 2.00
Lessons on Decorative Design — Frank G. Jackson..... 2.10
Lessons on Form — A. Blunck..... 3.15
Letters and Lettering — Frank Chouteau Brown..... 2.10
Lettering for Printers and Designers — Thomas Wood Stevens..... 1.00
Line and Form — Walter Crane..... 2.10
The Principles of Design — E. A. Batchelder..... 3.00
Theory and Practice of Design — Frank G. Jackson..... 2.60

ELECTROTYPING AND STEREOTYPING

Electrotyping — C. S. Partridge. Being revised.
Partridge's Reference Handbook of Electrotyping and Stereotyping — C. S. Partridge.....$1.50
Stereotyping — C. S. Partridge. Being revised.

ESTIMATING AND ACCOUNTING

A Money-making System for the Employing Printer — Eden B. Stuart $1.00
Actual Costs in Printing — Isaac H. Blanchard..... 5.00
Style 2. Annual Tables for Printers and Binders. Every practical printer insists on revising his cost figures each year, and for that purpose the cost-figuring tables, together with the blank sheets for use in annual inventory, have been bound together in convenient book form 2.00
Campsie's Pocket Estimate Book — John W. Campsie..... .75
Challen's Labor-saving Records — Advertising, Subscription, Job Printers. 50 pages, flexible binding, $1; 100 pages, half roan, cloth sides, $2, and $1 extra for each additional 100 pages.
Cost of Printing — F. W. Baltes..... 1.50
Employing Printer's Price-list — David Ramaley..... 1.25
Fundamental Principles of Ascertaining Cost of Manufacturing — J. Cliff Dando 10.00
Hint for Young Printers Under Eighty — W. A. Willard..... .50
How to Make Money in the Printing Business — Paul Nathan..... 3.20
Nichols' Perfect Order and Record Book..... 3.00
Order Book and Record of Cost — H. G. Bishop..... 3.00
Printer's Insurance Protective Inventory System — Charles S. Brown 10.00
Starting a Printing-office — R. C. Mallette..... 1.60

LITHOGRAPHY

Album Lithographique (specimens) $1.50
Handbook of Lithography — David Cumming..... 2.10
Lithographic Specimens 3.50
Photo-lithography — George Fritz..... 1.85
Practical Lithography — Alfred Seymour 2.60
The Grammar of Lithography — W. D. Richmond..... 2.10

MACHINE COMPOSITION

A Pocket Companion for Linotype Operators and Machinists — S. Sandison $1.00
Correct Keyboard Fingering — John S. Thompson..... .25
Facsimile Linotype Keyboards..... .25
History of Composing Machines — John S. Thompson..... 2.00
Thaler Linotype Keyboard..... 4.00
The Linotype Operator's Companion — E. J. Barclay..... 1.00
The Mechanism of the Linotype — John S. Thompson..... 2.00

MISCELLANEOUS

A Treatise on Photogravure — Herbert Deniston $2.25
The Art of Engraving 1.60
Author and Printer — F. Howard Collins 2.35
The Building of a Book — Frederick H. Hitchcock 2.20
Eight-hour-day Wage Scale — Arthur Duff 3.00
The Graphic Arts and Crafts Year-book, $5.00; foreign 5.80
Inks, Their Composition and Manufacture — C. Ainsworth Mitchell and T. C. Hepworth 2.60
Manufacture of Ink — Sigmund Lehner 2.10
Miller's Guide — John T. Miller 1.00
Oil Colors and Printing Inks — L. E. Endes 2.60
Practical Papermaking — George Clapperton 2.60
Printer's Handbook of Trade Recipes — Charles Thomas Jacobi 1.85
Writing for the Press — Robert Luce 1.10

NEWSPAPER WORK

Establishing a Newspaper — O. F. Byxbee ..... $ .50
Gaining a Circulation — Charles M. Krebs ..... .50
Perfection Advertising Records 3.50
Practical Journalism — Edwin L. Shuman 1.35

PRESSWORK

A Concise Manual of Platen Presswork — F. W. Thomas ..... $ .25
Color Printer — John F. Earhart.
The Harmonizer — John F. Earhart 3.50
Tympan Gauge Square ..... .25
Overlay Knife ..... .25
Practical Guide to Embossing and Die Stamping 1.50
Stewart's Embossing Board, per dozen 1.00

PROCESS ENGRAVING

Penrose's Process Year-book, 1906-7 ..... $2.85
Photoengraving — H. Jenkins; revised and enlarged by N. S. Amstutz 3.00
Photoengraving — Carl Schraubstadter, Jr 3.00
Photo-mechanical Processes — W. T. Wilkinson 2.10
Photo-trichromatic Printing — C. G. Zander 1.50
Prior's Automatic Photo Scale 2.00
Reducing Glasses ..... .35
Three-color Photography — Arthur Freiherrn von Hubl 3.50

PROOFREADING

Bigelow's Handbook of Punctuation — Marshall T. Bigelow ..... $ .55
Culinary French ..... .35
English Compound Words and Phrases — F. Horace Teall 2.60
Grammar Without a Master — William Cobbett 1.10
The Orthoepist — Alfred Ayres 1.35
Webster's Pocket Dictionary ..... .50
Pens and Types — Benjamin Drew 1.35
Proofreading and Punctuation — Adèle Millicent Smith 1.10
Punctuation — F. Horace Teall 1.10
Stylebook of the Chicago Society of Proofreaders ..... .30
The Art of Writing English — J. M. D. Meiklejohn, M.A 1.60
The Verbalist — Alfred Ayres 1.35
Typographic Stylebook — W. B. McDermutt ..... .50
Wilson's Treatise on Punctuation — John Wilson 1.10

PAMPHLET GIVING CONTENTS OF EACH BOOK MAILED ON REQUEST