

One
Hundred
Years

1796
1896



Mackellar, Smiths & Jordan
Company

An excerpt of the sections on typographical matrix making, mold making, and typecasting from the book

One Hundred Years. Philadelphia, PA:
Mackellar, Smiths and Jordan, 1896.

(In 1896 MSJ was a part of American Type Founders, but the constituent type foundries of ATF had not yet been fully integrated into the firm.)

Excerpted and reprinted in 2014 by Dr. David M. MacMillan
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This low-resolution digital version was prepared from photographs of my copy (the book is quite large, and will not fit conveniently on my scanner). For higher resolution versions of the images, see the original presentation of this excerpt on:

<http://www.CircuitousRoot.com/artifice/letters/press/typemaking/literature/general/index.html>

1796-1896

• One Hundred Years •

MacKellar
Smiths and Jordan
Foundry

Philadelphia, Pa.



*To our Friends and Patrons this Souvenir is
Respectfully Dedicated*



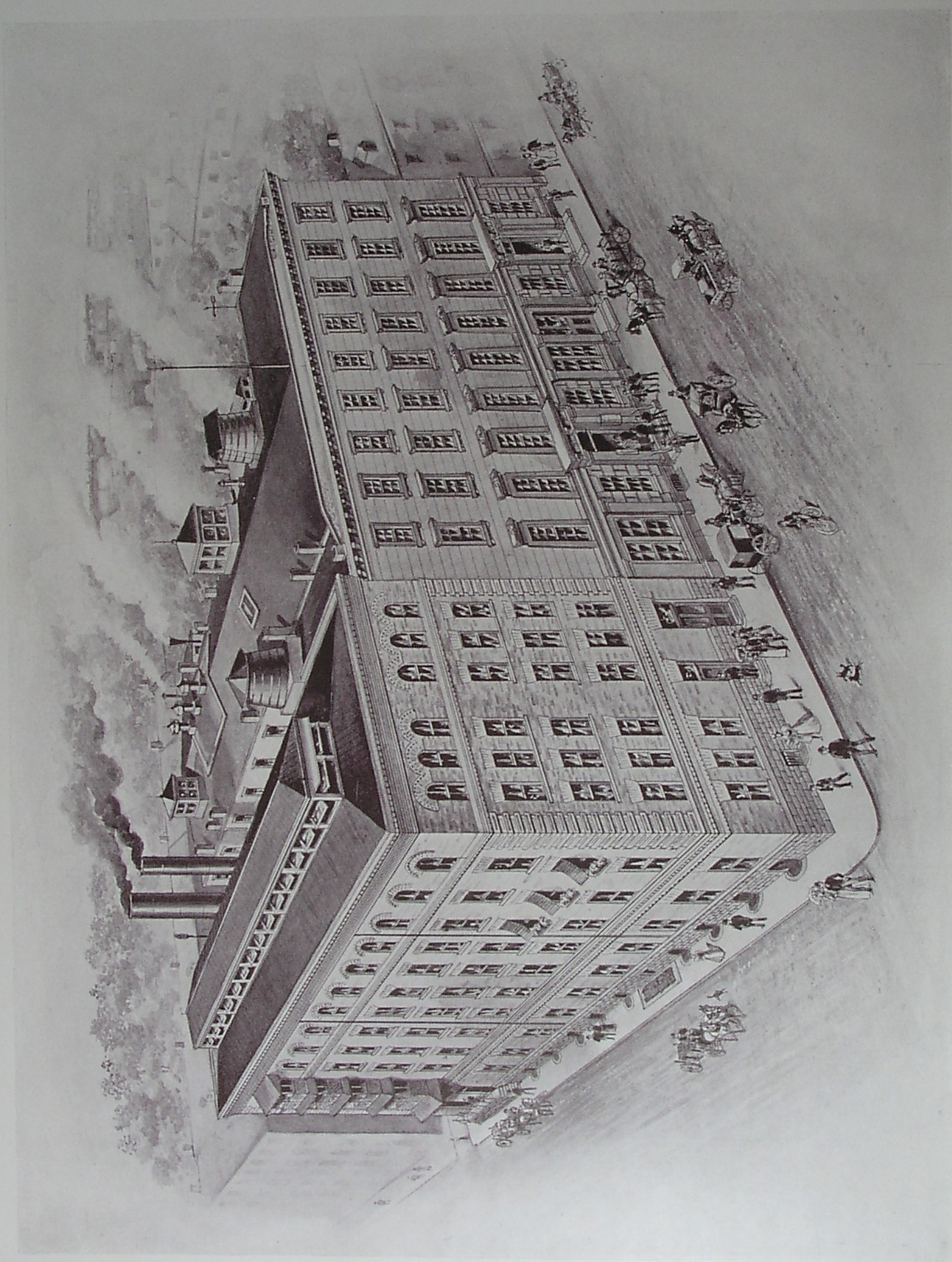
Viewing the Foundry

WITHOUT typography the history of the world would not be what it is. It was once said that if Cleopatra's nose had been an inch shorter, the whole face of the world would have been changed. So it may be said that had it not been for types

and type-making the affairs of the world would be very different from the manner we know them.

This idea strikingly suggests itself in a walk through the foundry, in which it is apparent that the progress of so many of the industrial arts and sciences has been utilized and placed under contribution to bring about the result of making one little metal type. The art of printing has itself, perhaps more than any other one influence, helped and encouraged and led to the advancement of the arts and sciences, which in turn, as even the most casual view of the extensive foundry shows, are called upon to aid in perfecting and fostering modern type-making.

On the third floor of the new building, situated for convenience near the centre of the busiest operations, is the office of G. Frederick Jordan, Manufacturing Manager, which is tastefully and conveniently fitted up with a view of dealing quickly with all the technicalities involved in the manufacture of type. It is in telephonic communication with the various parts of the great establishment, which, covering so much area, and with intricate machinery extending from the powerful engines and great cauldrons in the basement to the human-like type-fashioners on the upper floors, is a veritable little world in itself.



BIRDS-EYE VIEW OF THE MACKELLAR, SMITHS & JORDAN FOUNDRY, PHILADELPHIA

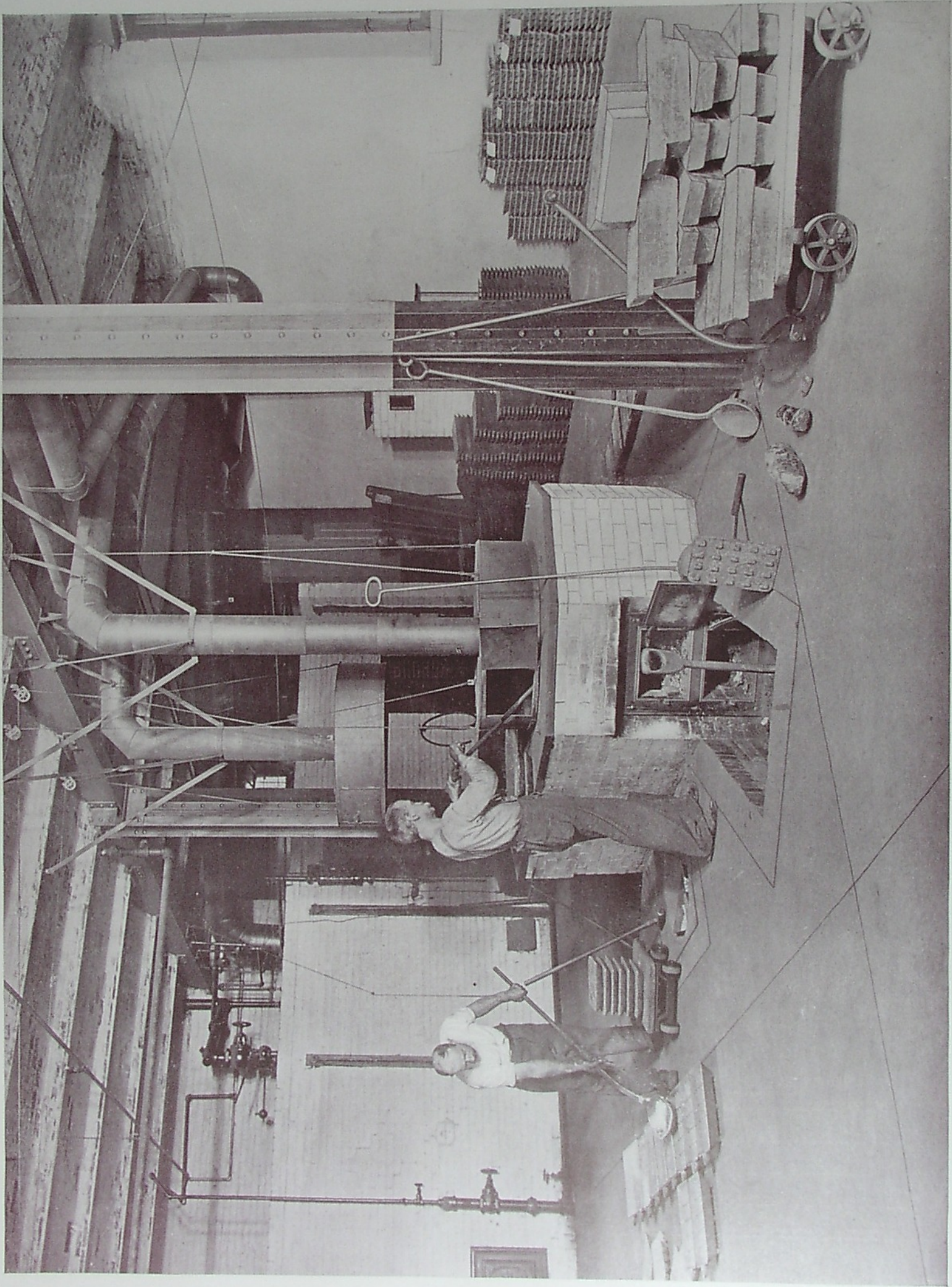


Among the many interesting objects in this office are the various diplomas for excellence in type-making, received by the foundry from this and foreign countries, including the Centennial Award, in 1876; that of the American Exhibition in London, in 1877; the Silver Medal at Paris, in 1878; the Silver Medal at Melbourne, Australia, in 1881; the Award at New Orleans, in 1885; the Gold Medal at Paris, in 1889; the Gold Medal at the International Exhibition at Jamaica, in 1891; and the Diplomas and Medals awarded at the Columbian Exposition, Chicago, 1893.

MIXING THE METALS.

One-half the entire space below the street, is devoted to the amalgamation of the various metals used in casting type. It is a spacious place, and unusually large quantities of lead, tin, antimony and copper, not yet fused or combined, may be seen there.

The importance of lead in the type foundry of to-day, and the enormous quantities required, cannot easily be estimated. It is what gives ductility and malleability to the metal composition intended for type purposes, just as antimony gives the hardness.



METAL-MIXING DEPARTMENT

Tin, on the other hand—that commodity which has caused so much economic discussion on political platforms—is what gives toughness. It enters largely into type-making, and large quantities of it are used. Among industrial metals it is the least acted on by air and water, and acid has but little effect upon it. Its sensitiveness to heat makes it easy to combine, but it cannot be used in large proportions in type owing to the effect of cold upon it. In Russia, bars of the metal have been known to break into small particles during very cold winter temperature.

Antimony is very largely used on account of its intense hardness and the fact that it does not rust, which give it its chief value in the useful arts, especially in type founding. This establishment has had for many years the reputation of being the largest consumer of this metal in the United States.

Copper, the first of metals employed by man in either the warlike or the peaceful arts, and which like gold is found in but few places, is used to add increased toughness and hardness to the composition.

The formulas for mixing the different metals vary according to the character and size of type, and the overseer in charge of the department is an expert. A great portion of the science of metallurgy may be seen illustrated in the metal vault, where two pots or cauldrons over furnaces are almost constantly full of molten metal. The fumes from the molten metal in the cauldrons are carried off by large pipes connected with a chimney specially constructed for that purpose. The metal vault is the most complete and thoroughly equipped in the United States, and a larger supply of the various kinds of metals used is kept in stock there than in any other type foundry.

MAKING THE MATRIX.

Equal almost to the stages in the development of a butterfly are the processes necessary for the birth of a full-fledged type. Long before the casting, the matrices, which give the type its face, have to be constructed, every part true to a fineness alongside of which a hair's breadth is bulky; and the very tools by which the matrix is formed have to be made also, each after its own plan and design, according to the style and character of the letter desired. It requires patience, artistic skill, and the most minute attention to

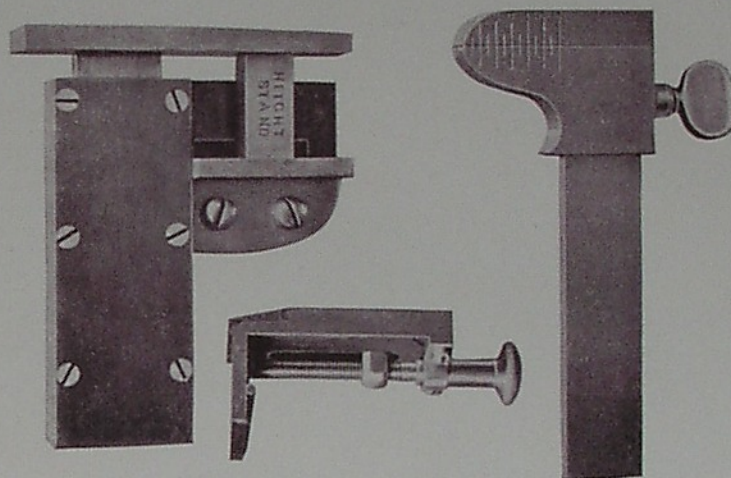


details to do this. To cut the punch or steel letter, for instance, not only requires an operator who is an engraver, and has a complete knowledge of the proportion and relation one printed letter should bear to another, but the steel has to be of the finest quality. The steel is first annealed to make it workable, and then, in order to overcome the resistance of driving it into the piece of copper forming the unfinished matrix, it has to be retempered. The operation of punch-cutting and of building-up and fitting the matrices is as fascinating as anything in the foundry, and to see a man cutting a punch and driving it into other metal, and examining and measuring and correcting the impression, it looks as if everything else depended upon the success of this operation—which, as a fact, it does.

Around the bench where the punch-cutter works are scattered magnifying lenses and delicate tools and instruments made to measure even the ten-thousandth part of an inch.

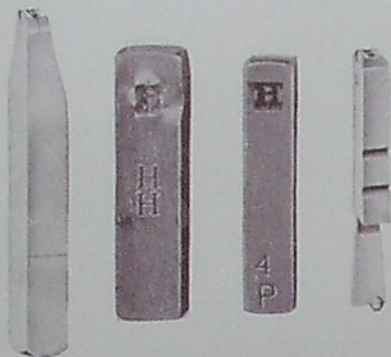
Quite as delicate in the care required as in making the movement or “insides” of a watch is the operation of preparing the matrix or oblong rectangular piece of copper which gives the form of the letter to the face of the metal type in the mould. It requires a series of experienced and specially trained operators, and some very ingenious and finely-adapted machinery, to bring into existence one little speck of type—for it is not a thing that can be made haphazard—and every point and part and proportion has to be as carefully studied in advance as the adjustment of a telescope to catch some eclipse or stellar phenomenon.

Three different methods are followed in the making of matrices. In one, the most ordinary method, a slab of flawless copper, with a very highly-burnished surface, is fixed in a block, and by means of a sharp blow the steel punch is driven in, leaving its impression behind it. This drive, as it is called, when the burr caused by the displacement of the copper is smoothed away and the impression mathematically tested by instruments, becomes the matrix in which the letter of the type is to be



formed. From that little thing may come the figure which in stock quotations may announce the wreck of a fortune or the letter which, by a typographical blunder, may ruin a young poet's reputation.

Most every one in reading has noticed a peculiarly sharp outline about script and italicized letters which makes its impression upon the eye in print. That is because



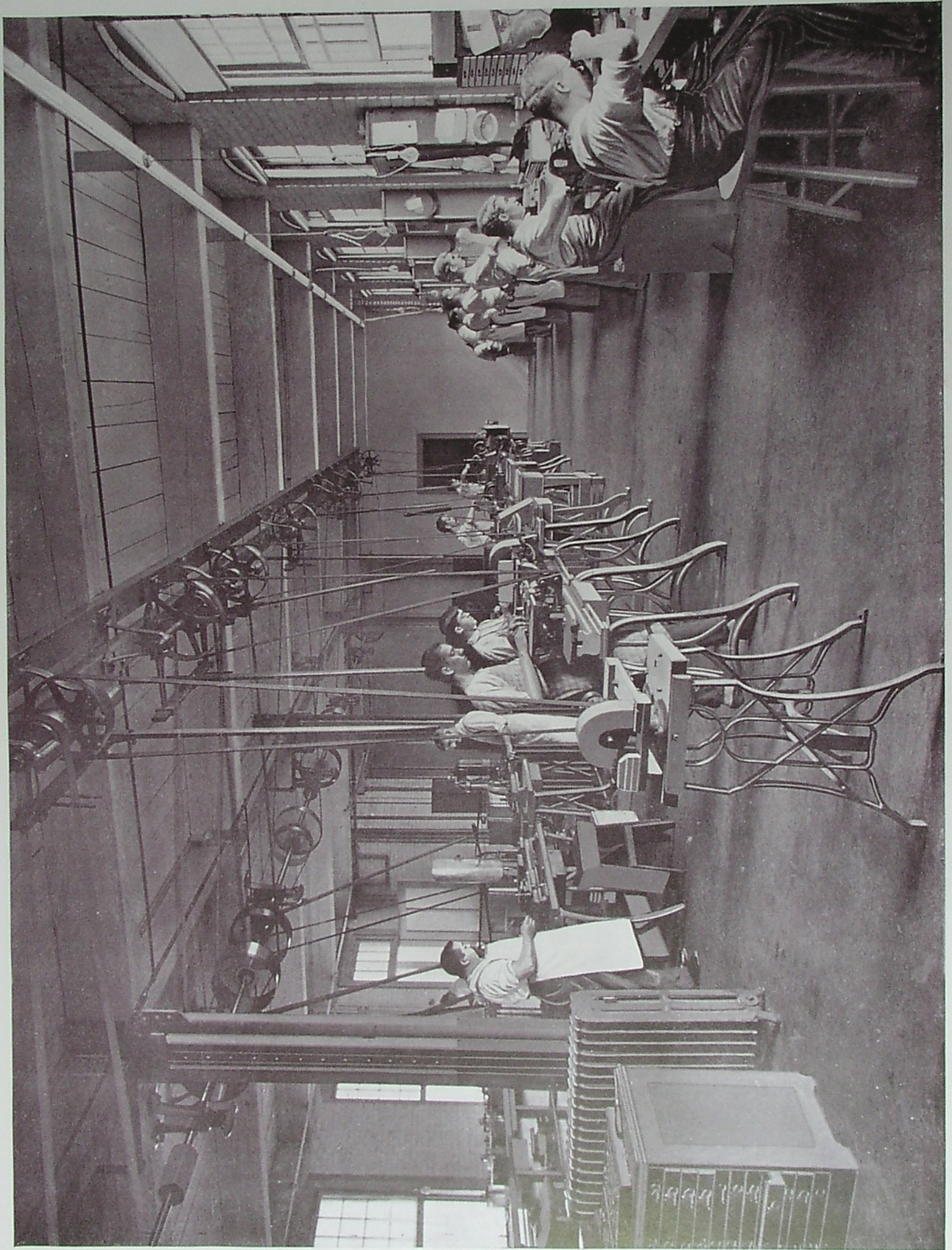
most of these, like Roman and other body type, are cast from matrices made with the punches which are cut on steel in the manner described. Few large-faced type, however, are made from such matrices.

Strange to say, it is by the electrotype process that some of the most satisfactory and uniform matrices are produced, and it has the additional advantage that whole fonts, including ornaments and everything, can be made at once, or small quantities of different letters be turned out quickly and with ease. Nevertheless quite as much care is required in the preparatory stages of this process of matrix-making as in punch-cutting, though in this no punch is used. Pieces of a metal softer than that of which type are made (which would be too brittle) have the letters cut on them very sharp and clear, and these specially engraved type or ornaments, or whatever they may be, have the letter or figure on them reproduced in the battery, the action of which causes copper to be deposited around the face of the type in the holes of the brass plates, of which there is one for every figure, letter, or point, to be made. The portions of the plates not intended to be exposed to the action of the battery are covered with wax before they are put in. Matrices can be made this way in the battery now by an improved process in a few days.

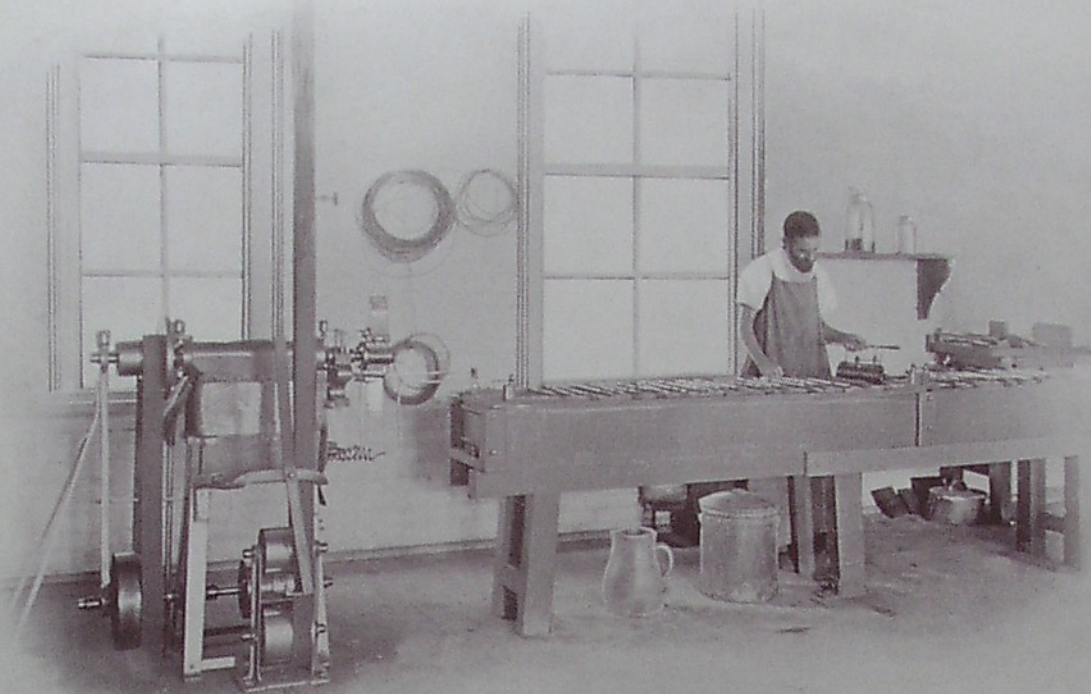


When the metal letter types are withdrawn from the plates their images appear imbedded in copper, and this, when filed and attached to a brass plate, becomes in its turn a matrix ready to reproduce type after its fashion and proportions when it has been finished, though the finishing requires some expensive machinery, and also dexterity on the part of the fitter.

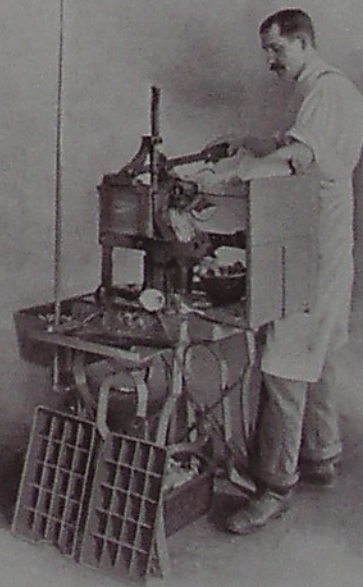
Like the dies or stamps for coin in the Mint, it is the matrices that give the type its character and accuracy and face value, and it is not surprising that they are



MATRIX-MAKING DEPARTMENT



carefully preserved and locked in vaults as among the most precious possessions of the establishment. In number they reach into the hundreds of thousands, and have been accumulating since the place was founded, some of them growing even more valuable as relics of the past printing age than for practical use in this busy epoch, with its own distinctive, if varied, typography. Among them are matrices from which came the first type ever made in Philadelphia. There are matrices which have furnished the type from which famous books have been printed—volumes that stirred the world of thought in their day. Here laid away like mummies of Egyptian sages, or the ghostly remains of Westminster's celebrities, are the forms that have stirred the literature of their times, and from which have emanated Bibles, great dictionaries, school text-books, early family almanacs, and such works as Macaulay's History of England, Thiers' Napoleon, Allibone's Authors and Dr. Kane's Explorations. Indeed, it has been asserted by a writer who saw the collection of matrices (the insured value of which is greater than that of almost any building given over to purely industrial purposes), that they form a complete record of the changes, improvements, and progress of typography, in America during the last hundred years.





MAKING TYPE-MOULDS.

Very important in the process of making a type—in fact, next to the matrix—is the mould in which the type is formed. These moulds are all made in the establishment, require the constant attention of skilled workmen, and are made of the very finest steel. Owing to the extreme variations of temperature to which they are subjected, allowance to a great nicety must be made for this in their construction.

The old hand-mould, used in casting type for a hundred years, consisted simply of two pieces of steel set between wooden blocks with the matrix inside. It is practically obsolete. If any one doubts the extent of the improvement made in the mould as to results, all they have to do is to compare some book or magazine printed even as late as the forties with the artistic publications of to-day.

At the first glance it would seem that there is comparatively little difference between the primitive device for casting type and that now in use. In reality the mould now used has been made not only more durable and reliable, but is fashioned

with great care, and devised on studied mathematical principles. Improvements in the processes of hardening steel, a better understanding of fused metals and their combination, and the skill and experience resulting from a century of activity and invention in one particular branch connected with the business, are all very important factors that enter into the advance made in recent years in producing type-moulds capable of turning out the finest and most accurate type.

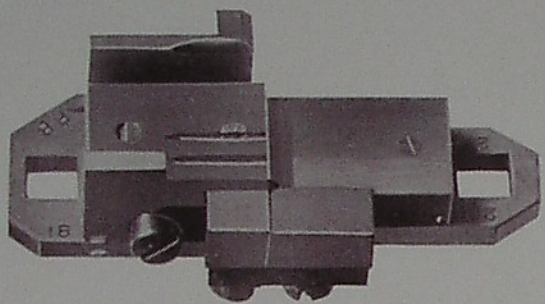
Whatever improvement in type there has been made in four hundred years, and that is a very long time, is more than anything else the result of improvement in the mould. It is apparent, for instance, that a finely-made mould, as nearly perfect in all its parts as it is possible to make it, and upon which a great deal of time has been expended, will turn out better and more uniform type even than if each individual type was made by hand, as they were in the infancy of the printing art.

The moulds used in this foundry in casting most of the type on the hand and steam casting machines are made of the finest steel, ground so as to be perfectly accurate in all their parts. Usually there are twelve or thirteen pieces of steel in a mould, all fastened together very solidly, but so arranged that they can be adjusted very readily by steel screws of a special make. This construction, when put together, is as smooth and slippery as silk, so fine is it finished. As to size, it can be held in the hollow of a man's hand, and weighs about a pound, though there are moulds intended for much larger type that weigh nearly three times as much. The parts are made from templets of hardened steel, all so exactly alike in their construction that the part of one mould, when necessary, can be transferred to another.

Every one of these parts is ground to a standard shape and size on laps of lead, tin and emery. The grinding is the most particular part of the operation, and is done entirely by hand. As this work progresses the pieces are constantly gauged by the workman in order to get them true to the standard. Every bit and particle of steel that enters into the mould has, of course, to be carefully hardened and tempered, as in the process of casting the type it has to undergo great heat and quick change of temperature in cooling, and the slightest variation in the mould would make imperfect type. All the filing, drilling and grinding of the parts composing the mould are done in the establishment, as it is absolutely necessary that the oversight, manipulation and fashioning of every part should be in the same experienced hands by which it is put together. If every part of the mould is not exactly right, it will cast a wing or burr on the type, or cause some other blemish that will condemn it.

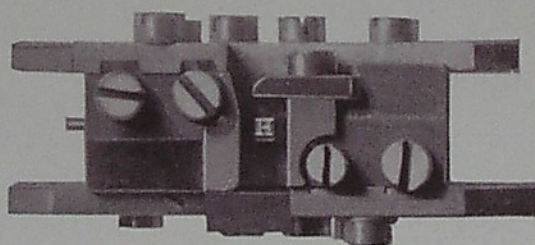
One of the important functions of the mould, in casting the type, is making the nicks. These are cut in the steel and ground with emery to the required standard, shape and size. It is a most difficult task to fit the nick or nicks into the groove in the body of the mould, so as to prevent a burr being cast upon the type at that

point—for, although a mould might be perfect in every other respect, if there was the slightest flaw or irregularity in cutting the nick-grooves, the type that would be turned out, while otherwise accurate, would have a burr on the nick. Even some very slight inaccuracy somewhere else in the mould might not materially affect the type, but the nick must be accurate, for its smoothness and correctness are of primary importance to the compositor who handles the type in setting it up. It takes an expert an hour to make and fit a single nick in a mould, and some moulds have as many as four nicks.



In every mould a piece of stout steel wire is placed in a drilled hole in the upper body, which must be a perfect fit and point, otherwise the mould is useless. This pin-mark is used for discharging the type out of the mould after it is cast. When the upper half of the mould is raised the pin point lifts the type with it.

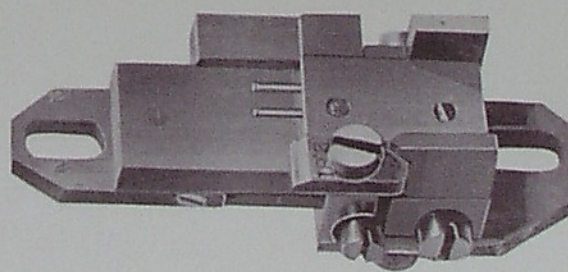
That part of the mould which forms the jet attached to the type has also to be of the proper size, to insure solidity to the type, and large enough to let the metal get to the matrix and form the letter before it is chilled, and thus give a perfect exactly right, the matrix cast a fine, clear letter on thing about the machine-
 ture of the side bearings, the proper thickness and



MOULD FOR CASTING ORDINARY TYPE.

is done by three screws holding a register which can be adjusted to the standard to keep it true. As a matter of fact, in repeated use and subjected to such extraordinary variations of temperature, one moment full of molten lead and the next chilled, the mould does vary in accuracy, which necessitates frequent testing with the standard matrix.

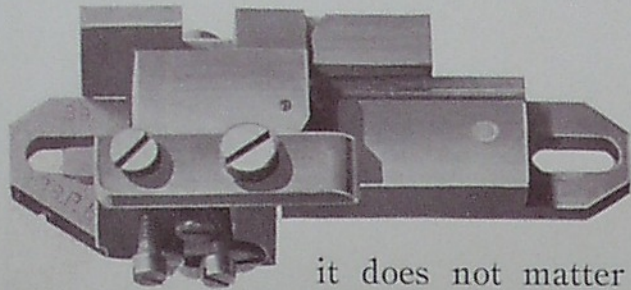
face. If the jet is not in the mould will not the type. A particular mould consists in the fix-
 which regulate and give width to the type. This



But if everything else were accurate about the casting of a type it would all be useless without a perfect alignment of the type. The letter must be so cast on the face of the type, no matter how large or small the body may be, that when any number of types are placed together they will all be in a perfect line. Otherwise they would be zigzag, or up and down like a school-boy's pot-hooks and hangers. This alignment of the letters is secured by a piece of steel ground perfectly flat, and adjusted to a seat on the lower register, and that held by a strong steel screw to prevent any change in the line. A small piece of brass is also inserted, by means of which the line of

type may be raised or lowered in the casting. This little piece of brass is only one sixty-fourth of an inch in thickness. The importance of this is apparent when it is remembered that type has to be made now, in large quantities, that is distributed and used with type made, perhaps, twenty years ago, and both must line as perfectly as if cast in the same mould.

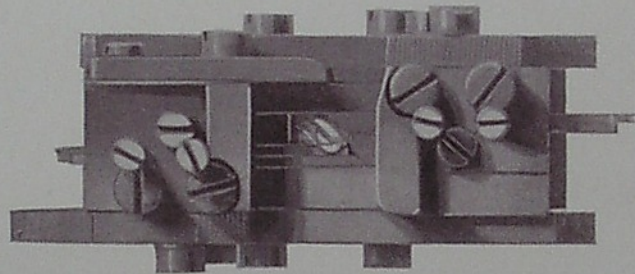
As to accuracy in all its parts, it is impossible to have a mould too correct.



The more time, care and mathematical precision given to a mould the better the results will be. The body of the type, the height, line and set, have all to be considered and gauged. If the body of the type is not exact,

it does not matter how correct the matrix may be, the letter will then be on the end of a piece of metal, but it will not be a type. The variation of one ten-thousandth part of an inch in the gauge of a mould is sufficient to condemn it—which is not surprising when it is considered that through a crevice no larger than

a pin-hole a stream of that must resolve itself but eloquent tongue of perfect as it is possible metal to be. Moulds are what are known as

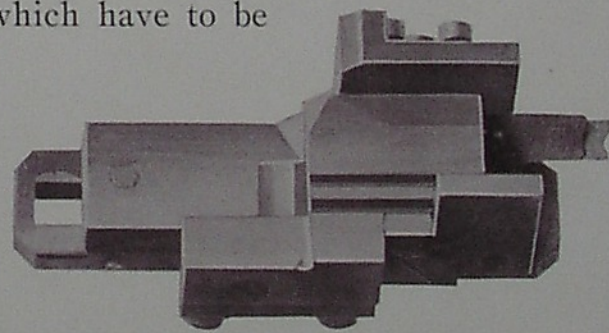


MOULD FOR CASTING SCRIPT TYPE.

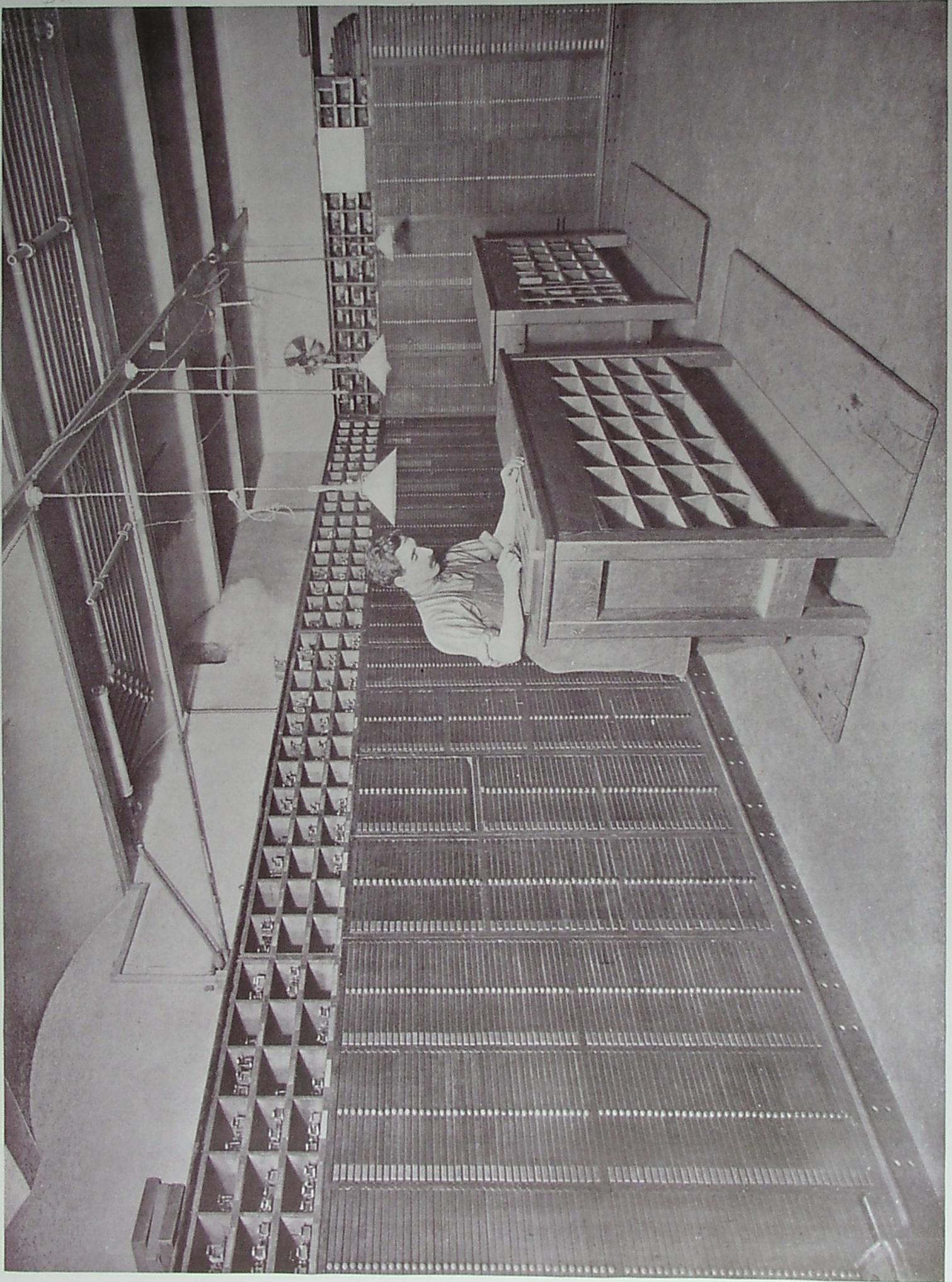
opened the reverse of ordinary type. This is in order to allow the kern on the flange of the letter to discharge. By the use of adjustable beveled slides, which look like knife-blades, the same moulds also cast characters without kerns. These moulds are much more difficult to make than ordinary type-moulds on account of the slides, which have to be a perfect fit in all respects.

molten metal is forced quickly into that tiny, civilization: a type as for anything made of for casting script type "left-handed," and are moulds for casting ordi-

For casting cored type a contrivance is used which is practically a machine as well as a mould. It is so adjustable in its parts that in the casting it forms the mortise in the letter. Thus, for instance, a capital T, instead of hav-

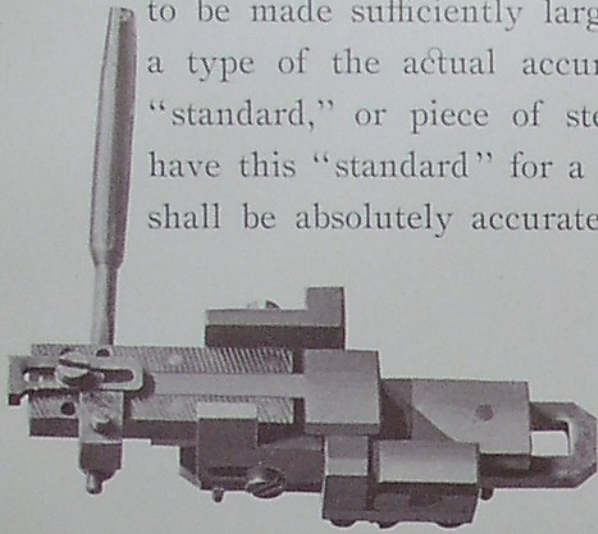


ing a mass of metal on each side as wide or wider than the cross line on top, is cut out, so that the body of the type follows closely the shape of the letter itself. This makes the type lighter in weight, and allows other letters to set close to it. A man can make an ordinary mould in about the same time that it takes to make the cored body alone of this machine. Every part of it has to be gauged to the standard, and the work of construction involves a great deal of mathematical nicety and precision.



FIRE-PROOF VAULT FOR STORING MATRICES AND MOULDS

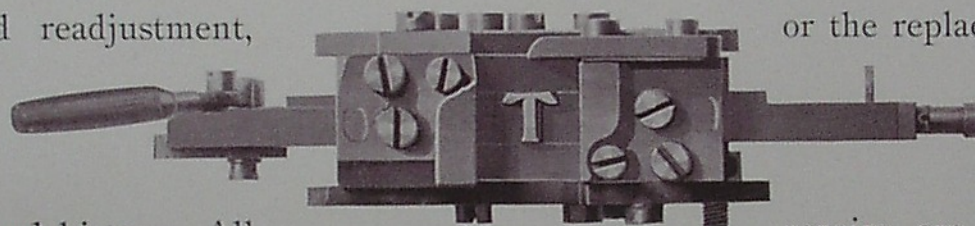
Every character requires a distinct and separate setting of the core. The mould has to be made sufficiently large in all its parts to allow for the shrinkage, and turn out a type of the actual accurate proportions in every respect. To do this there is a "standard," or piece of steel, the hardest procurable, and every mould made has to have this "standard" for a test or gauge. It is so important that these pieces of steel shall be absolutely accurate that they are kept constantly in about the same temperature, as any material variation of heat or cold, even the heat of the hand, causes them to vary. They are the key to this branch of the business, since no type-mould nor type can be accurately made without them. Every different type body requires a distinct standard of its own.



As may be easily imagined, the moulds requiring such care, skill and time to make are very valuable, and are kept in a vault as carefully as if made of gold. This establishment has about one thousand moulds, some of which date back many years. There are moulds, such as those for musical notation, which have been in use for half a century. An average mould can be used continuously for three months, but

hauling and readjustment, of its most delicate parts. The moulds are numbered, and a register is kept of their birth and history. All repairs are also recorded.

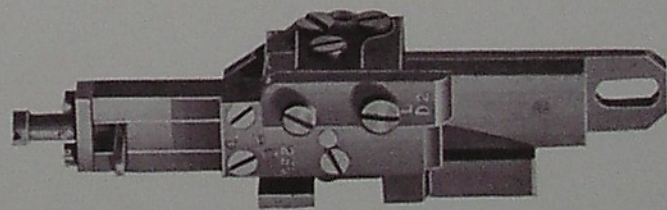
Every mould has to be at all times in perfect trim and condition, ready to turn out perfect type. In this way each mould becomes individualized, and has its separate and distinct history. From one may have emanated the type that has gone into a family almanac, a doctor's treatise, a child's school-book, or a great daily newspaper. Another may have contributed to tell the story of a Sunday-school festival, stirred up enthusiasm in a political campaign, or done duty for a theatre poster. Thus the history of every type is locked up in the mould, and it can always reproduce that which it has produced before.



MOULD FOR CASTING CORED TYPE.

It takes a competent man about a week to make a complete mould, including the work in the rough. The men who do the work are taken as apprentices at sixteen years of age, and do nothing else until they become competent and proficient.

With the old hand-mould a man could cast from two to three thousand types a day. With the mould now used he is able to average about fifty pounds, or forty thousand types a day.





HAND TYPE-CASTING DEPARTMENT

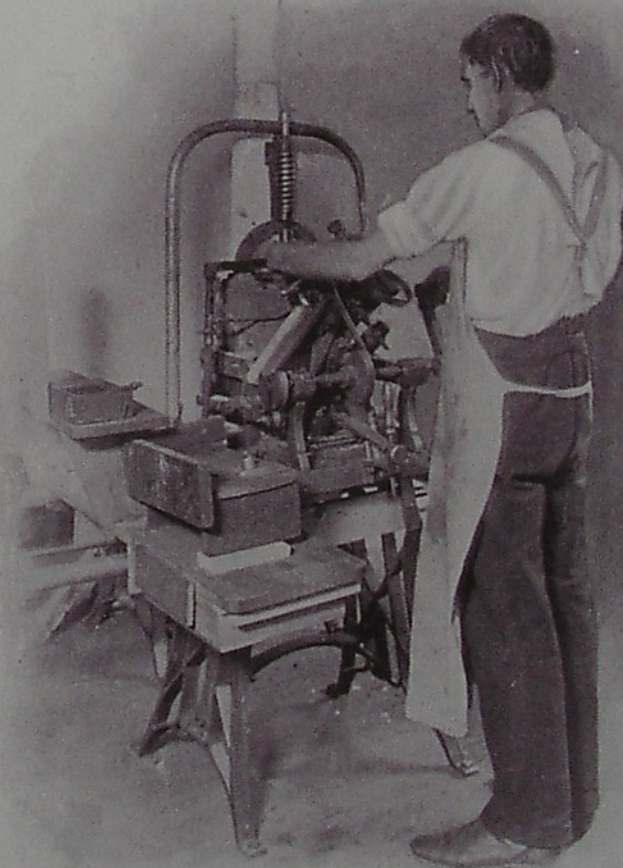
CASTING THE TYPE.

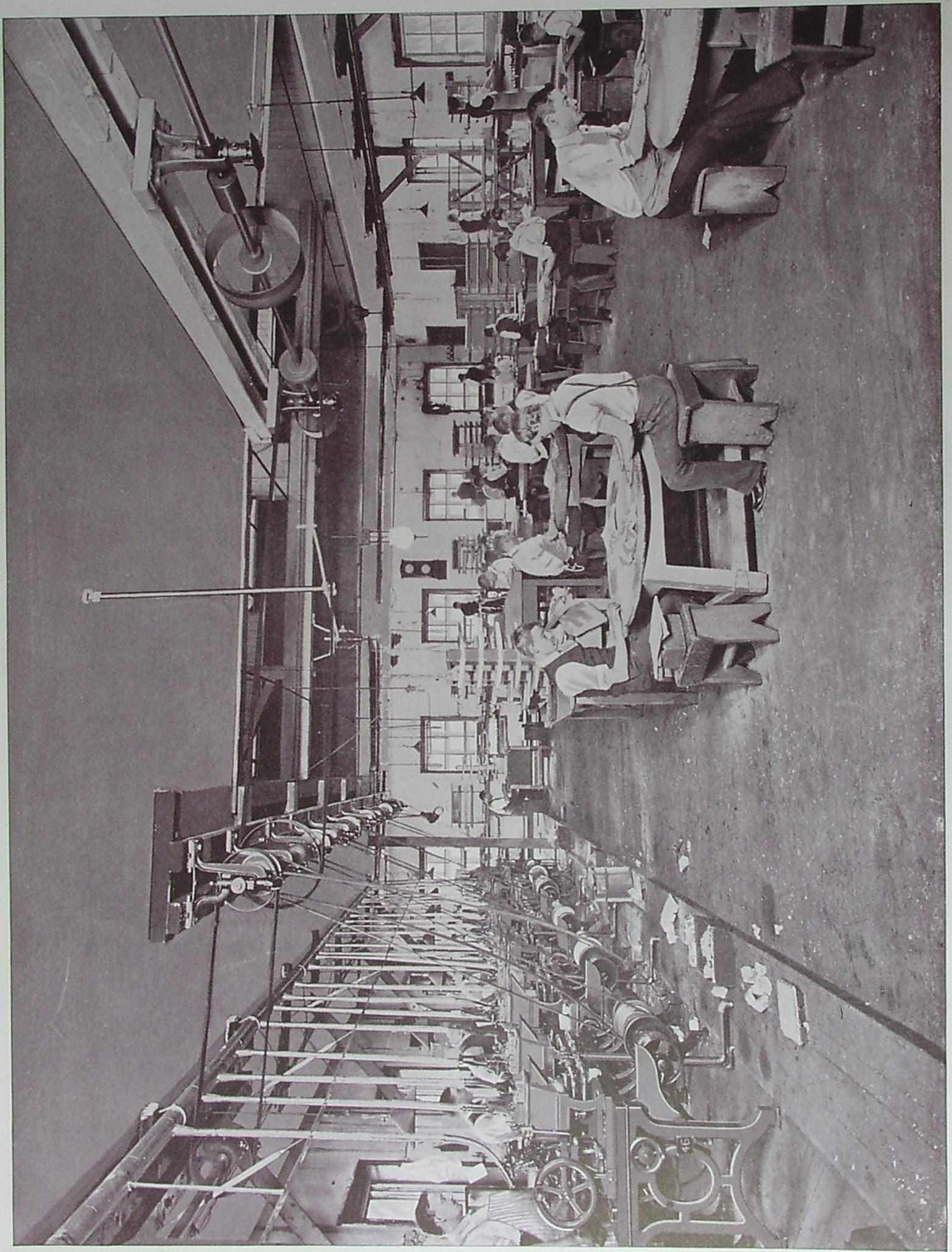
Next to the coining of money, as seen in the mint, there is no process in the manipulation of metals more interesting than the making of type. In a walk through the foundry this strikes the visitor most impressively. There is demonstrated almost at a glance the practical development that has taken place within a comparatively few years in all metal-working processes, but especially in type founding. Even the change from the Conestoga wagon to the mile-a-minute locomotive is not greater nor more surprising than the transformation from the old hand-mould, in which type was cast for so many years, to the perfecting machine which acts automatically and in a second does all the work, even to finishing the type that formerly occupied many hands, and required much labor and extended time.

The ordinary hand-mould is, of course, a thing of the past, and is no longer seen in the establishment, except in the Matrix-Fitting Department, where it is used in the process of fitting.

Each half of the hand-mould screwed together and held in a wooden box was the counterpart of the other. One-half had a ridge to form the nick on the type, and the other half had a spring for holding the matrix in position. The metal, taken from a little kettle, was poured into the opening in the mould in which the spring held the matrix tight. In order to have the molten metal penetrate to the finer parts of the matrix to produce a sharp face, before it cooled, the workman had to give the mould a quick jerk. Of course, in such a process there were many imperfect type. After the mould was opened, hooks which were fastened to its sides were used to discharge the type. This was a slow and tedious process, which could not possibly supply the enormous demand for type nowadays. It seems strange that this primitive method—the same, with little variation, in vogue since the first metal type was cast—should have continued so long; but it was not peculiar to type founding, for in cannon and bell casting, and almost all forms of metal casting, the same primitive and early methods were long preserved.

For ordinary type production this rudimentary process has given way to what is known as the hand-casting machine, which





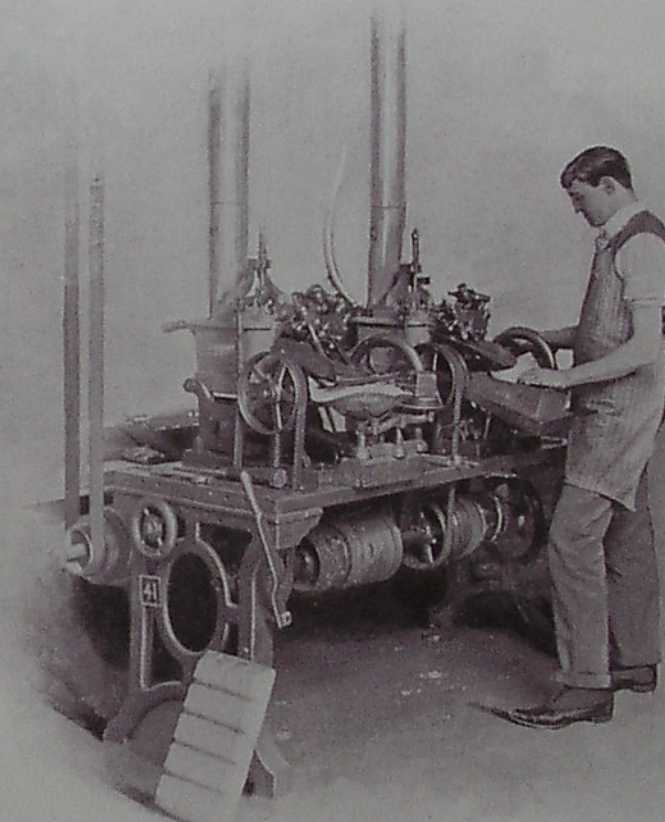
STEAM TYPE-CASTING, RUBBING AND DRESSING DEPARTMENT

requires a skillful and intelligent operator. From two thousand to three thousand letters a day of ordinary body type was a good day's work by hand-mould casting for one man, who now with a casting machine turns out a vastly increased number of better type and with much less labor. The construction of the machine, with its various attachments, is such that a type is cast at every revolution. The larger the type the slower the work, because the metal takes a longer time to set or cool. This difficulty, however, is in a great measure overcome by the use of adjustable pipes, through which currents of cool air are forced directly on the mould, when necessary. The pump in the melting pot over the furnace forces the hot metal into the mould through a nipple. The mould is very much the same as in hand casting, and the matrix is similarly held by a spring and lever. At each revolution of the machine only enough metal is forced into the mould by the pump to fill it. As the mould returns to its position the upper half is raised and the type is released.

There are in the foundry sixty hand-casting machines, and their click and clatter and uniform motion when in operation is only comparable to the rhythmic movement and whirr of the spindles and rattle of the looms in a large woolen or cotton mill. For small orders and job work the hand-casting machine has the advantage over the modern steam-casting machine and the automatic perfecting machine in that it can be handled easier and can be more quickly changed from one body to another. Nothing so far has been devised to take its place for all practical purposes.

It frequently happens that sorts are cast on these machines which in an hour afterward are doing service on a printing press. Some very quick work in this particular line has been done in this foundry.

On the fifth floor of the new building, which is high and well ventilated, with twenty-four windows looking out on two streets, there are, in addition to the sixty hand-casting machines, fourteen steam-casting machines. In these the mould is fastened to the machine by screws and bolts, the matrix in the mould being governed by a spring and lever, and the mould held together by a steel arm, to insure uniformity in the size of the body of the type.



During a day's work of ten hours one of these machines turns out from fifty to one hundred pounds of type, according to the size of the body.

Even the hand-casting and steam-casting machines show the great advance that has been made within the past sixty years, when type was cast by the slow, old process of the hand-mould.

As the fonts are small and the matrices have to be changed frequently, the hand machine is used for casting job type. It requires more time to cast job type of the larger sizes, and the necessary care and slowness make the hand machine the best for this purpose. In the case of body type, the weights of the fonts frequently running into thousands of pounds, the matrices do not have to be changed often, and it is therefore cast mostly by steam machines, two of which are operated by one man with ease, thus doubling the production.

When the type having been cast leaves the mould it is yet in an unfinished condition. The jet or piece of metal attached to the foot of each letter has to be carefully removed, which is done by boys, who are called "breakers." Rubbing the type to remove the burr and give uniform smoothness is the next process. Peculiar flat files, made for this purpose, are on tables, and over these the workmen rub one type at a time, first on one side and then on the other, or else, as in the case of plain type, rub them on large circular stones.

The type is then set up in single lines, on wooden sticks about three feet long, each character separate. This places the type in a condition ready for the dresser and picker, usually separate workmen. The dressing consists of cutting a groove in the bottom of the type where the jet has been broken off, giving it feet on which to stand, and in smoothing off the body. This operation is performed on a steel rod, three feet long, which must be perfectly true in every part. It is clamped in an iron bench, and accurately adjusted for that purpose. Picking consists of examining each letter under a powerful magnifying glass, and discarding all the bad and imperfect type. This completes the various processes necessary in making a type, excepting in the case of such letters as require to be kerned on their sides.

There are, besides the various letters in the Roman and Italic body type, many characters in the

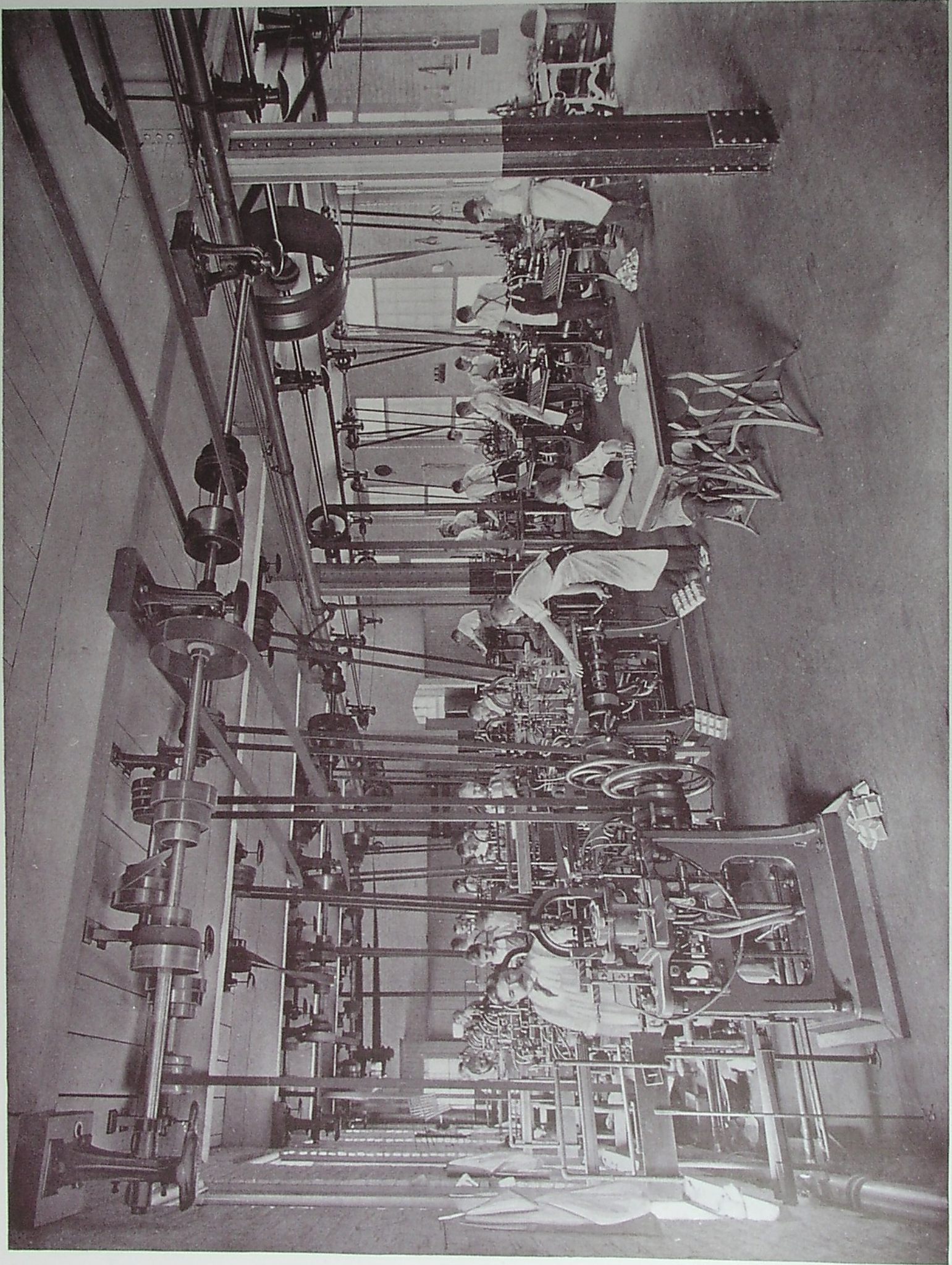


jobbing designs, and especially in the numerous script faces, which must have some of the metal cut away after the type is cast, in order to allow the letter which follows in the formation of words to come close enough to maintain the regulation space between them. This process is called "kerning," and is a very intricate operation, requiring skill and dexterity on the part of the operator. As the kerning of type varies both in the depth of cut and the slope, it is done on machines of which there are three different patterns specially constructed to meet all the requirements necessary. The type to be kerned is held by the operator, one at a time, against an adjustable gauge set to the required angle, which is slotted to admit the type, thus holding it securely while the sharp teeth on a rapidly-revolving wheel cut away from the side of the body, directly under the face of the type, as much of the superfluous metal as is required, without injuring the face in the least.



Surprising as are the various hand and steam-casting machines, it is not until the new automatic perfecting machines are seen, and their remarkable results confronted, that one wonders if it is possible for anything else to be accomplished in type-making. With the precision of clockwork this intelligent, compact mass of steel transforms the molten metal into the completely-fashioned and finished type, ready for the compositor's case. To watch them in stealthy, quick, automatic motion, doing their work so thoroughly and without a flaw, is a striking exemplification of the magic of mechanical accomplishments in this day of marvelous achievements.

Up to within a few years ago the annual output of finished type by this foundry averaged about five hundred thousand pounds. To-day, with the latest devised machinery and improved facilities in the various departments, and an increased demand for its productions, the annual output averages over one million pounds of finished type, which is used by printers all over the world.



AUTOMATIC TYPE-CASTING DEPARTMENT

The first automatic perfecting machine used in this foundry was of German invention, and it cast, broke, rubbed and set the type mechanically. Shortly thereafter several machines of English invention were introduced. Unlike the German invention, these machines discharged the type from the mould by a projecting body-piece very similar to the type itself. Passing through a channel and breaker, and making a turn in quadrant, the type was rubbed before adjustable knives, and a cutter took off the shoulder. It was then turned a second time and dressed. In the German machine the body of the type was carried horizontally, and in the English machine perpendicularly, and, among other things, saved a turn. One of these machines could produce on an average about sixty pounds of type a day.

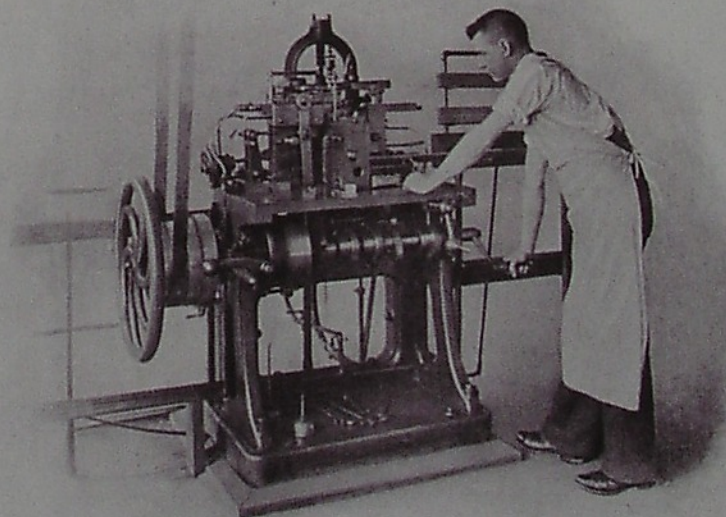
The automatic perfecting machine now most extensively used, with its improvements, many of which originated in this foundry, has not only all the good points of the old machines preceding, but many others which they did not possess.

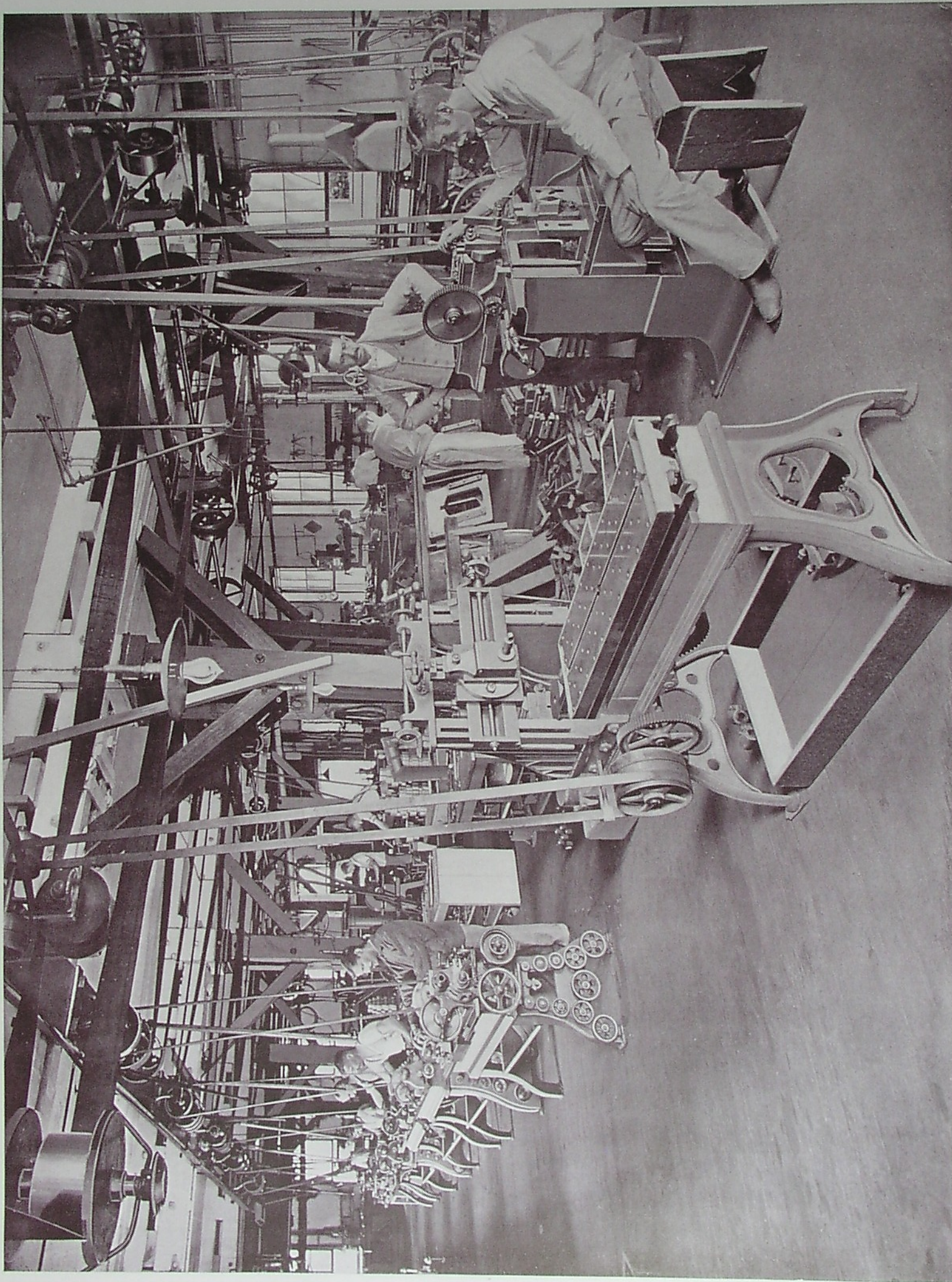
The mould used in the improved machine is a most ingenious and intricate piece of mechanism, is made of the finest selected steel, carefully hardened and tempered, and is constructed of many parts, all beautifully fastened and dove-tailed together. A different mould is required for each body of type.

In the hand-casting machine the matrix is held by a spring and lever, and comes in contact with the mould as it closes to receive the molten metal. The matrix is then released by a spring and roller, and the mould opens and the type is discharged; but after that it has to be broken, rubbed, set and dressed, all by hand, whereas in the machine now used all this is done automatically.

In the automatic perfecting machines the matrix is held in a steel box entirely separate from the mould, which comes in contact with it as it closes, when the type is cast. The matrix is then relieved by a lever and two pins, the slide on top of and attached to the mould opens, and the type is discharged on a platform supplied with breakers and a device for grooving. As the type passes under the face of this, it is broken and rubbed by a series of cutters, after which it passes to a channel, where it is dressed. The type, all finished, are received on sticks, after which they are picked and paged.

In picking ordinary steam machine-made type it is found that about five per cent. is rejected as being bad, whereas it is not one-eighth of one per cent. in type





MACHINE CONSTRUCTING DEPARTMENT

cast on the automatic perfecting machines. Moreover, the perfecting machine casts one-third more type than the steam-casting machine, the face of the type is much sharper, there is more regularity in thickness and body, and more general uniformity.

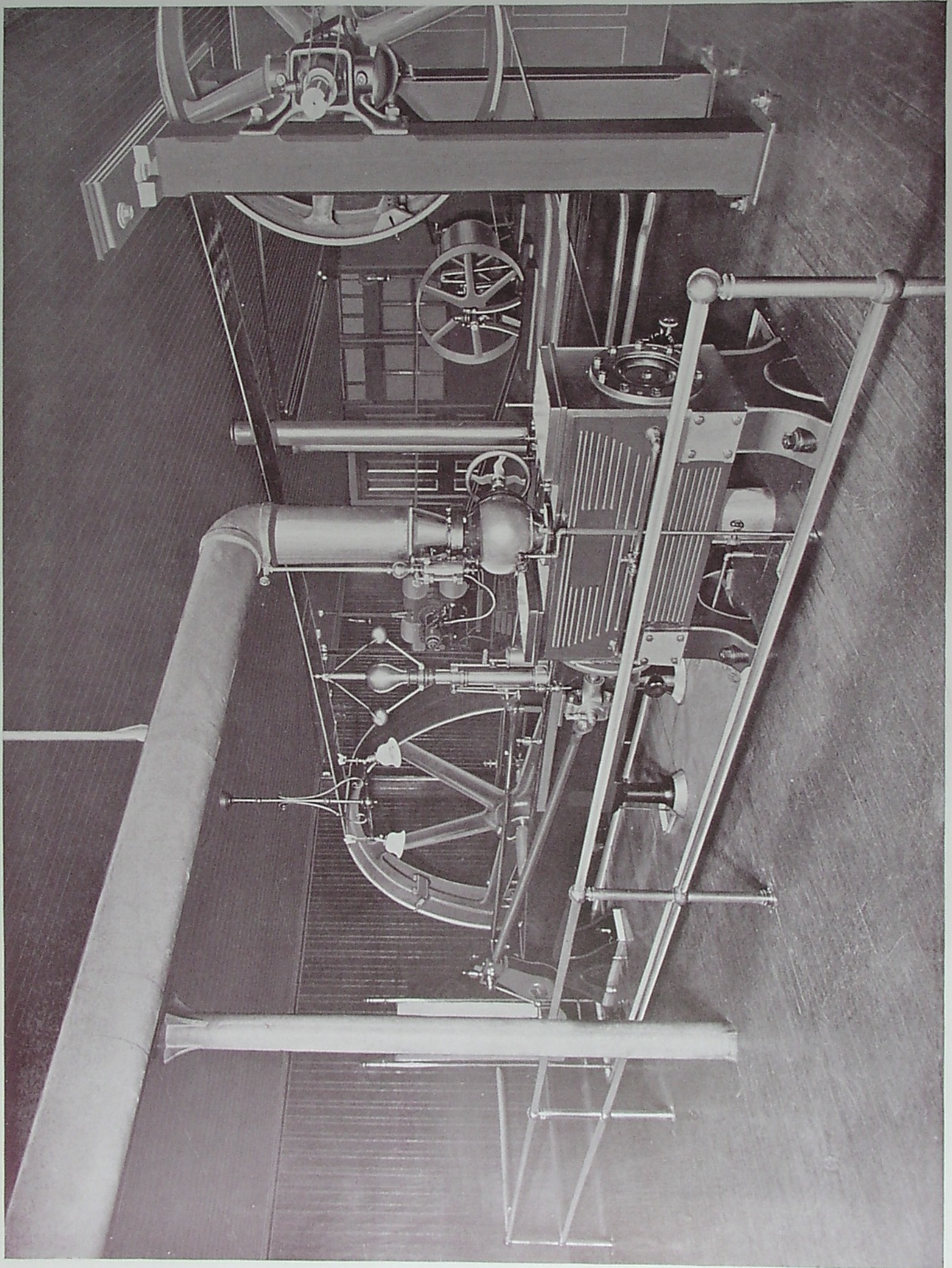
Equally complete and finished in its results is the automatic space and quadrat machine, invented in this establishment, and acknowledged to be the best device for the purpose in existence. It has an average output of seventy-five pounds, as against forty pounds on the hand space and quadrat machine. The spaces and quadrats coming from this machine are made and finished with a mathematical nicety equal to the type, and have long since acquired an established reputation wherever used.

The automatic perfecting machines and the space and quadrat machines in their every part, as well as other machines used, are built in the large Machine-Constructing Department connected with the establishment. This branch of the business, which is located on the fourth floor, is equipped with the latest improved machinery necessary to meet the demands made upon it. It gives employment to a large force of skilled mechanics, who are kept busy adding to the already large number of machines and tools in use, and repairing such others as get out of order from continual wear.

The effort to bring about uniformity in the size of type bodies in all the type foundries of the United States has resulted in the adoption of a uniform system of point bodies, known as the American Point System. In this system one point equals one-twelfth of a Pica, therefore Pica measures twelve points and Nonpareil six points. The value of the system gradually dawned upon the mind of the intelligent printer, and met with general recognition and approval.

Taking into consideration the daily association of printers with type, it is to be supposed that they would become intimately acquainted with all its distinguishing characteristics. Such, however, is not the case.

Different parts of a type are designated as the face, the counter, the beard, the shoulder, the shank or body, the kern, the pin-mark, the nick, the groove and the feet. It is worthy of note that a considerable portion of this nomenclature is similar to names applied to the human frame. The face is the part from which an impression is taken, and various portions of its surface are called stem, ceriph and kern. The straight flat stroke of a letter is the stem; the fine lines at the top and bottom of a letter are ceriphs, and a projection over the shank or body, like that at the top of the letter f, is a kern. The counter is the space between the lines of the face. The lower portion of a type, on which it is supported whenever it is doing service as part of composed matter, is divided by a groove, made by the type-dresser, and, probably on account of this division, is called the feet instead of the foot. The nick is a hollow cast in the shank or body of the type, one or more nicks being inserted in various fonts, and their position being varied. While the nick in all American and English



ENGINE ROOM AND DYNAMO

type is always cast on the same side as the bottom of the letter, and, while the number and position of the nicks used in any one font are uniform, a wide diversity is purposely made in the number and position of the nicks of different fonts of letter. In England the body of the letter is called the shank. This word is not in general use in the United States, but it serves a good purpose in drawing a clear distinction between the sizes of type established by the respective standards and the metal which supports the face of a letter. By some writers that portion of the top of a type not occupied by the face is called the shoulder, while others call this part of a type the beard. The true system, however, seems to be to call that portion of the type the shoulder which is between the top of the body and the face of the type. The beard is the sharp edge on the upper part of the body running parallel with the top and bottom of the face. The pin-mark is a circular indentation on the side of the body near the face, made in the process of casting by a small pin in the mould.

MAKING BRASS RULES.

Just as trifles go to make up the sum of life, or as sands make the mountain, so the small things assume great importance in typography, and a comma or dash is often as expressive as a whole printed sentence. This is especially true with brass rules, as they are called, which serve a variety of purposes in printing, such as outlining pages, inclosing a special or distinct matter like addresses, programmes or menus, or marking the close of a chapter or the end of an article.

In times past, when borders, often made of blocks of wood, were used by the printer, brass rule was a comparatively simple affair, and there were but a few styles made. Nowadays, owing to the exacting demands of the artistic printer, a greater variety of styles and more care in the cutting are necessary.

There are made in this foundry no less than five hundred and eighty-five distinct designs or faces of brass rule, and in their general division they consist of single, parallel, double and triple lines; dotted, hyphen, block, waved and turned rules.

