The Pantograph Demythologized

Or,

Half an Hour of Heresy

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A large-scale argument questioning the accepted history of the mechanization of type-making

120+ slides (Yikes!)

Way too much for a half-hour talk

This is the abbreviated version for the talk. Both it and the full version are online.
A Different Perspective

Mine is an outsider’s view.

I was not trained in printing or the graphic arts, but in literature (Ph.D.) and computer programming (the family profession for sixty years).

So I have had no instructor in type. I’ve never had to give the correct answer on a test. I just read the books and examine the evidence.

Frequently, I find that they do not match.

One Such Area

The Mechanization of Matrix-Making

Two random modern examples of the canonical story:

Punch-cutting was finally mechanized in 1885 with the invention of Linn Boyd Benton’s punch-cutting pantograph.


In 1885 Linn Boyd Benton ... invented ... the Benton punchcutting machine ... it did not cut punches but instead engraved matrices ... via pantograph.

- Paul Shaw. *Revival Type.* (2017)

The problem: Everything in these statements is false.
Many times I’ll say “Benton didn’t...” or “Benton wasn’t...”

I’m not Benton-bashing. His work was extraordinary, important, and extremely influential.

It’s just that there was so much more and so much before.

To tantalize: By the time the evidence shows that Benton was engraving matrices, you could purchase matrix engraving services on the open market and a number of important faces had already been cut.
Why Look at Patrix Cutting First?

‣ It is an extremely important aspect of the general mechanization of matrix making in the 19th century.

‣ If we don’t understand just how common hand patrix cutting was, we will:
  - Underestimate the pre-1880s production capacity for matrices.
  - Misunderstand the use of some of the earliest pantographs (especially Benton’s) for cutting both punches and patrices.
Quick Technical Review
(Simplified)

Three major methods of creating a matrix from a new design:

Engrave a **punch** in steel, harden the steel punch,
    then **strike** (or press) a matrix (and then **justify** it).
    With or without the use of **counterpunches**, depending on your tradition.
Cutting/engraving either by hand or by rotary-spindle pantograph.

Engrave a **patrix** (pattern letter) in soft metal (near-typemetal, or brass),
    then **electroform** (aka “electrotype”) a matrix.
Cutting/engraving either by hand or by rotary-spindle pantograph.
(A patrix is very much like a punch, but in soft metal.)

Engrave a **matrix** directly,
    Done only by rotary-spindle pantograph, not by hand.

Other methods not considered here:
- Sand casting (for large letters, 18\textsuperscript{th} century and earlier)
- Hand cut punches, intermediate lead matrices, and sand-cast brass matrices
    finished by repunching (for large types; see Nelson & Mosley)
- “Sanspareil” matrices (hand-cut and assembled, late 18\textsuperscript{th} century)
- Composite methods (Rimmer: Punch, cast type, trim beard, electroform new mat)
- CNC matrix engraving
A hand-cut punch

A punch, probably hand-cut.
Thompson Type Machine Co.
(Early 20th c.)

Probably a patrix.
Provenance unknown.

An Electroformed Matrix.
ATF Series 476 Goudy Handtooled Italic.
60 point. For the Barth Type Caster.

A punch, probably hand-cut.
Thompson Type Machine Co.
(Early 20th c.)

A machine-cut punch.
Lanston series 61, Cochin.
12 pt for composition.

A Directly Engraved Matrix.
ATF Series 530 Bernhard Gothic Heavy.
96pt / 84pt titling. For a pivotal type caster.
Patrix Cutting and Matrix Electroforming

“[in Abel Buell’s time / 1759] the making of type was entirely a hand operation. ... It was not until the invention of the Benton pantograph punch-cutting machine in 1885 that any other method was known. All type made before 1885 was therefore dependent on hand punch cutting, ...”

- Carl Purington Rollins (1947)

Rollins’ list of who designed which type remains the basis for all such lists today.
He knew his type.
Yet he did not know that patrix cutting existed.

* Partial earlier lists appeared in The Inland Printer in 1927 & 1898-1900 (Loy).
Widespread Use for New Types

“The discovery of the electrotype process ... became an incentive to type founders to create new faces, ... This made it possible to bring out new styles at a moderate cost, as the pattern letters are cut on soft metal and electrotyped, instead of the old method of cutting everything on steel.”

- William E. Loy (1898)

“The present practice is to cut letters larger than 14-point in soft metal”

- Harry Carter (Fournier, 1930). Q.E.D.

See Saxe’s 2016 article for a study of the role of patrrix cutting and the pivotal type caster in enabling 19th century ornamented types.
But Forgotten in the US (and England?)

Recall what Rollins said in 1947: “[no] other method was known.”

Few people in the later 20th century knew type better than Mac McGrew, but...

“WEDDING TEXT ... It is recorded that the 12-point size was cut in type metal in that year [1901], instead of cutting punches or engraving matrices directly. Electrotype matrices were then made from these cuttings. It is uncertain whether this new method of cutting delicate faces resulted in unusual problems and delays, but the face was hailed as ‘new’ in 1907 and again in 1909.

- McGrew. (1993) [italics mine]
Why Forgotten?

Electroforming was used for piracy; it was something the foundries didn’t really want to talk about.

Type-making wasn’t talked about much anyway until the 20\textsuperscript{th} century. In 1898 Loy had to apologize:

“It is hoped that the publication ... may awaken an interest in the subject, ... the purpose being rather to put on record, before it is too late, such facts ... as may be worthy of record.”

But two important 20\textsuperscript{th} century reasons:

Some of the best known accounts of how type was made were written by people associated with punchcutting businesses (example: Beatrice Warde, writing in \textit{The Dolphin}, 1935, contrasts only hand vs. machine punchcutting).

The entire emergence of type as a historically studied field, from William Morris onward, was prompted by romanticism. (See the Kochs, Hammer, Chappell, etc.) Hand punchcutting has romance written all over it. Electricity and acid baths do not.
Relevance to Pantographs

If we don’t realize how common patrix cutting was in the 19\textsuperscript{th} century, we will misinterpret the use of the typographical pantograph.

Patricia Cost’s book on the Bentons is excellent and will remain the standard work on the subject for many years. But she was misled by:

- Not realizing that patrix cutting was a common technology
- Trying to integrate William Gregan’s reconstructions of Benton’s early work into a punch-to-pantograph worldview
- Believing Henry Lewis Bullen’s fantasy about P. T. Dodge convincing Benton to try to cut punches

“To summarize, the first version of Benton’s pantograph machine was engraving type metal originals at Benton, Waldo & Co. in Milwaukee by 1884. The second version of the machine cut the sample steel punch for Dodge. Benton received a patent for the third version in 1885.”


These were actually all the same machine. The real distinction is between this machine and his second vertical machine of circa 1899.
So, What Is a Pantograph? (1/2)

This is a pantograph

Type 1: Four-Bar Machines

- Performs scaling and, optionally, transformation
- Pivot, tool, and tracer all line up for simple scaling
- Invented by Christoph Scheiner, early 17th century

B.K.Elliot Co. drafting supplies catalog, circa 1943

Both of these types operate using a principle of similar triangles.

Some of these were called pantographs

Type 2: Single-Arm Machines

- Hollerith Hand Card Punch
  United States Census Bureau
- Janvier “Reducing Machine” for making coining dies
  Birmingham Museums Trust
- Benton Vertical Pantograph, Style 2 (Matrix Engraving)
  ATF 1912 specimen book
- Kennan, for Sculpture
  1862 Exhibition catalogue

Janvier “Reducing Machine,” for making coining dies
  Birmingham Museums Trust
What Is a Pantograph? (2/2)

Other Mechanisms of many kinds do pantograph-like things. Some were called “Pantographs.”

Type 3: Other

The German word for “pantograph” (when it isn’t just “pantograph”) is “storchschnabel” / “storchenschnabel” (literally “crane’s / cranes’ bill”). This is also a kind of geranium.
The Single-Arm Pantograph, to 1884 (1/6)

The path to Benton starts a long way from Milwaukee

Origins in the Rose Engine and “Ornamental Turning” in the 16th century. This was cam-controlled geometric machining, primarily for ornamental items.

A relatively late example, constructed by Mercklein for Louis XVI prior to 1780.

From an early postcard by the CNAM

The portrait or medallion lathe of the 18th century. Nartov (Russia, 1710s–1730s). Teubers (German, 1740). Pantograph capabilities implemented with chain and shaft mechanisms. Used to cut commemorative medals from larger patterns cut in soft materials.

Nartov’s Portrait Cutter Type 2, 1721

The images of Nartov and his lathe are copyright The State Hermitage Museum, St. Petersburg, Russia. Used here for noncommercial scholarly purposes under the terms of their permissions statement.
Industrial & Engraving, 1840–1880 (1/8)

Type 1 (4-Bar) & Type 2 (“Other”); Excluding Machines for Wood Type

There were a lot of them. That’s the point.

Joshua Heilmann. 1829. Handstickmaschine [Hand Embroidery Machine]. Multi-needle, 4-bar pantograph-controlled. Widespread adoption from ca. 1850; claim that 20,000 machines were in use in Switzerland in 1910. Replaced by paper-tape controlled machines starting ca. 1890.

Georges Leschot (1800–1884). Watchmaking (plate drilling). Important and well-known (awarded a medal in 1845):

“En 1840 ... George Leschot modifia profondément les bases mêmes [the basic foundation] de la fabrication horlogère à Genève”

- Journal Suisse d’Horlogerie, 1884.

Technical notes: 4-bar, horizontal format. Spindle is supported on its own swinging frame. This is a characteristic of later Taylor-Hobson (and thence Gorton & Deckel) machines.

From Tanner via Wikimedia Commons

No freely reproducible images exist.
A machine incorporating a 4-bar pantograph, used for engraving complex designs for printed securities. Germany, by 1864.

(“Security” printing links back to Rose Engines and “ornamental turning.”)

Schmidt. 1866. Germany. “Gravirmaschine.”
4-bar. Not sure of its intended use.

From the Polytechnisches Centralblatt (1866)
Industrial & Engraving, 1840–1880 (8/8)

Peter Martin Shanks. 1874
4-bar.
For wood printing plates

Circa 1879  English.
Very similar to Keller-Dorian (1883)

Unidentified

Two pantographs for engraving rolls for printing calico, Musée de l’impression sur étoffes de Mulhouse, France.

From Ure’s Dictionary (Hunt, 1878), Vol. IV Supplement

Note: Brocade Engines (developments of the portrait lathe, really) continued in use throughout and into 20th century
Summary, Circa 1880
Well-established Victorian High-Tech

Precision pantographs dominate these industries:
  Minting/Coinmaking
  Calico printing rolls
  Wood Type

Precision pantographs are significant in these industries:
  Watchmaking
  Banknote/Securities engraving
  Optics (lens engraving)

Perhaps lesser-precision pantographs dominate these industries:
  Sculpture Reproduction
  Hand embroidery (in Switzerland)

Pantographic Engraving for lettering is common

Pantographs also used for:
  Wood (relief) and copper (intaglio) printing plate making
    (especially in map making and scientific work)
The First Pantograph in Metal Type Making

Not Benton. Central Type Foundry, St. Louis, 1882.

Machine made in Germany.
Imported by the Cincinnati Type Foundry in 1880.
Acquired/used by the Central Type Foundry, 1882.
Operated by William A. Schraubstadter.
Patterns made by Gustave Schroeder (how?).
First faces: Geometric (1880, but to Pica only),
Geometric Italic (1883), Scribner (1883),
Morning Glory (1884).
Horizontal machine; presumably four-bar.
Direct matrix engraving in brass.

From an 1892 Central Type Foundry specimen book
Evaluating the Evidence

How do we know this?

Loy (1898). Schroeder “made for Central the patterns for Geometric Italic, Morning Glory, and Scribner, of which matrices were cut in brass by machine.”

Nicholas Werner, writing many years later:

1925. *American Printer*. [I have not seen this yet]
Data: Schraubstadter. Matrix engraving.
Geometric, Geometric Italic, Morning Glory.

1927. *The Inland Printer*. (“St. Louis’ Place…”)
Data: Schraubstadter & Schroeder.
Direct Matrix Engraving
Geometric, Geom. Italic, Morning Glory

1931. “St. Louis in Type Founding History”
Data: Pantographs were horizontal

1932. Weibking obituary in *The Inland Printer*.
Data: Machine imported 1880
To Central T.F. in 1882
Typewriter .

Why should we believe him?

He was there.
He later acquired this machine and used it (with Schroeder and on his own). What he says fits with Loy’s biographies him (and of Schroeder).
Unlike Bullen, he did not tend to make things up.

From Loy in *The Inland Printer* (1899)
Benton’s First Vertical Pantograph

Actually, we know very little.

Bullen’s stories don’t hold water:
  ▪ No evidence that Benton was ever working on a composing machine
  ▪ Not true that there were no punch/patrix engravers available
  ▪ Story of P. T. Dodge and the first punch is demonstrably false

What do we know?
  1882. Patent record shows Benton working on a mold for casting leads (US 254,792)
  1883. No information
  1884. Feb. 29, 1884. Pantograph patent filed (issued Dec. 22, 1885 as US 332,990)
      Patent specifies only punch cutting.
  1884. July. Trade Note in *The Inland Printer* claiming the ability to cut punches in steel.
  1889. First machines leased.

Although the two images at right are later, they look almost exactly like the one shown in the 1891 Benton-Waldo Type Foundry brochure (Cost 2011, p. 68)

Identifying feature: WW lathe headstock as spindle

From the English version of the 1884/5 patent
My thanks to Mark Knudsen

Question: Do any survive?

From *The Inland Printer* (1924). Rehak (1993) has a higher-quality version of this photo.
Benton Cutting Punches in Steel

From the “Items of Interest” column in *The Inland Printer*, Vol. 1, No. 10 (July 1884): 21.

Benton, Waldo & Co., of Milwaukee, claim to have perfected a machine for cutting punches for original characters for type foundries in steel,—an invention which will much cheapen the ordinary process of cutting by hand. It will cut from the largest to the smallest punch—even to half-diamond; while as a time-saver, we may state that a piece of work now requiring four hours to perfect by the hand process can, under its operation, be turned out in half an hour.

This, by the way, is how we know that Bullen’s 1923 story that P. T. Dodge of Mergenthaler Linotype is false. The Mergenthaler company only became aware of Benton after the Blower Linotype (1886), which used (first) electroformed matrices and (later) mats from hand-cut punches. But Benton could cut punches in steel at least two years earlier.
Benton’s Accomplishments

‣ Werner (1931) attributes to Benton the first Roman faces cut by machine.

‣ The first successful pantograph of this style:
  • Single-arm in vertical format
  • Horizontal pattern and workpiece
  • Rotary spindle
  • Variable-length arm to solve problem of distortion
    cf. Hulot/Janvier (circular) and Hollerith (distorted)

‣ He kept going.
  ♦ Second vertical pantograph, for matrix engraving, circa 1899
  ♦ Decades of hard work at ATF, with M. F. Benton
  ♦ At least three other pantographs:
    • 1899 “Opto-Mechanical” machine for reverse-engineering
    • Modified machines (the “Ad-Cut”)
    • Wax plate machines
  ♦ He was a modest man who aligned himself with a very good P.R. machine

We do not know which face Werner meant, but Benton was busy cutting his “Self-Spacing” (unit-set) types during this period.
Schroeder & Werner, 1889–?

The First Matrix Engraving Service

Gustave F. Schroeder and Nicholas J. Werner.
Left the Central Type Foundry in 1899 and formed a partnership
Schroeder had another pantograph made by the Boyer Machine Company
   (the same company built the prototype Burroughs adding machines)
Together they cut:
   For the Central:  DeVinne (first eight sizes),
                     Victoria Italic (first eight sizes)
                     Hermes, Jefferson, Novelty Script,
                     Multiform, Johnston Gothic (l.c.)
   For the Boston:  Façade Condensed
   For BB&S:       Era series
Schroeder left for California in 1891
Werner continued, cutting:  DeVinne & Victoria Italic (finished), Quentell,
                            Flemish Extended (for Stephenson, Blake),
                            Caxton Bold (four larger sizes, for BB&S)
Werner designed and cut:    DeVinne Condensed, DeVinne Italic,
                            Midgothic, Antique No. 6
Werner joined the Inland (1895) and for them cut at least part of:
                            Skinner, Gothic No. 8, Extended Woodward,
                            Condensed Woodward, [+2 more ca. 1898]
Schroeder continued, cutting:  Aldus Italic (four sizes), Sierra (eight sizes),
                              French Old Style No. 2 (18 point),
                              Victoria Italic l.c. (6 to 24 pt)
Werner must have continued cutting by machine; it isn’t clear if Schroeder did.

Sources:  Loy’s biographical sketches of Schroeder and Werner.
          Werner’s 1927 1931, and 1932 articles.
Wiebking/Hardinge Pantograph

The most important independent matrix engraving service of the 20th century

Used for all Ludlow types

Henry Hutchins Hardinge (1863–1946)

Robert Wiebking (1870–1927)

Wiebking born in Westphalia (Kingdom of Prussia). Family emigrated to USA in 1881. Apprenticed to a commercial engraver in 1884. Started in business in 1893.

Hardinge born in Ontario. Co-founded Hardinge Brothers machine tool company in 1890; left in 1895.

Wiebking and Hardinge build their first pantograph matrix engraver in 1894.

Wiebking designed several faces and cut many more, including Goudy’s early work. Wiebking & Hardinge also have a history as typefounders (Hardinge type casting machine and the Advance Type Foundry), but that’s a story for another time.
One of the Survivors

The ex-Ludlow Wiebking/Hardinge Pantograph
at CircuitousRoot, August 2018

The light bulb on top glows brighter as the motor turns faster.
Benton’s Second Vertical Pantograph


Patent specifies both matrix and punch cutting. Several of its claims refer to matrix cutting specifically.

Removable quill (patent for its cutter grinder not filed until 1900).
Clarity of Language

This is not a “Frigidaire”

(1927 General Electric “Monitor Top” Refrigerator, photographed by “Magi Media”)

This is not a “Ford”

(1931 Chevrolet Series AE Independence Phaeton, photographed by “Qfieger” in Germany)

This is not a “Benton”

(Pierpont / English Monotype punch engraving pantograph, shown in Legros & Grant (1916))

Neither is this

(Goudy at work on his Engravers’ & Printers’ Machinery Co. Model D rotary spindle pantograph engraving machine, just before the 1939 fire.)

Benton, Wiebking and Pierpont worked to tolerances in the hundred-thousandths of an inch. We do them a disservice if we cannot even name their machines properly.
Benton’s “Opto-Mechanical” Pantograph

US patent 790,172, filed July 21, 1899 (issued 1905). In 1906 Benton called this his “delineating machine.”

Reverses a regular pantograph. Microscope is the optical tracer; can trace an existing type. Pen draws at an enlarged scale. Can tilt the type to condense and expand design. Microscope automatically adjusts its height to keep in focus over a tilted type!

This is just brilliant.

I’m avoiding the term “Benton Delineator,” as it has been used ambiguously in the past.)
20th Century Benton-Vertical Derivatives (1/5)

Linotype & Machinery Ltd. (UK)

Later, make unknown

Legros & Grant (1916)

Mark Barr, for The Linotype Co. / Linotype & Machinery Ltd.

Patented ca. 1902 (GB ?, US 759,957, filed 1902)

Note: Barr patented a wide variety of pantographs and related devices. Note to self: See also GB 22,106 of 1900, pantograph with microphone annunciator.
Frank Hinman Pierpont.
Patents filed 1906 (GB 7206 of 1906, US 938,074).
But two styles shown in 1925 and 1956 films - one much more like Benton’s.

The ex-Lanston (US) machine which went to Hartzell, then M&H, then Giampa was a Pierpont machine (Fritz Klinke has a photograph of it online).
20th Century Benton-Vertical Derivatives (3/5)

Mergenthaler Linotype (US)

An illustration in Wilkes (1990), p. 57, shows Barr vertical punchcutting pantographs in an “amerikanischer Gießerei vor 1900” (but Barr’s machine does not date to before 1900).
It is possible that this is the Mergenthaler Linotype Company.

By 1923, MLC was using a machine which looks a great deal more like a Pierpont. The same machine appears in their 1961 film The Eighth Wonder.
Photographs by Stan O. Coutant of the Intertype factory in Brooklyn in 1966 show machines very similar to the late machine from Linotype & Machinery Ltd.

A machine which looks exactly like a Pierpont machine is now owned by an ATF member. It is said to be ex-Intertype.

Naturally, John Cameron [“Poet of Empire”] Grant and Lucien Alphonse Legros made their own.
Some European foundries such as Stempel seemed to use Benton-derived machines. In those which did not, this general style of horizontal four-bar pantograph (storchschnabel) seemed common.

Two German matrizenbohrmaschinen, by Emil Gursch and H. Bernert, from an article by Julius Wernicke in Klimsch’s Jarhbuch, 1909.

My thanks to Patrick Goossens for discovering this article.
An unidentified pantograph in the Musée Renaudot, Loudun, France. According to its placard, it came from the Deberny & Peignot foundry.

Lane & Lommen (Dutch Typefounders’ Specimens, 1998) show a photograph of the engraving room at Typefoundry Amsterdam in 1948 which has two (unidentified) horizontal-format 4-bar pantographs. Each is built into a kind of desk.
Goudy used Model D rotary spindle machines made by the Engravers’ & Printers’ Machinery Co. of Sag Harbor, NY. Shown here from *The American Machinist* at its introduction in 1919.

History back through Eaton (ca. 1900) to Engle (1880s)

History forward to Cronite

Gorton adopted the removable quill concept on several of its machines, making them suitable for matrix engraving. But this is their 3-K Matrix Machine, (shown in a 1935 catalog). Weight: 1,800 pounds.

In a 1999 LETPRESS posting, Bill Simon (editor of *The Ludlow Quarterly*) said that matrix engraver “Henry Sheer (sp)??” in NY used a “Godzilla sized” Gorton engraver weighing 2,500 pounds to make Ludlow and Linotype mats. Allowing for some exaggeration, that suggests a 3-K.
Summary of Technologies - 20th Century

Type-makers will use every technology that works.

Industrially: E. P. Prince, Louis Hoell, Charles Malin, Paul Rädisch, August Rosenberger, Henk Drost, . . .
It continues today, though at a very much reduced scale.

Hand patrix cutting continued into the 20th Century in Europe.
Bauer, Stempel, Typfoundry Amsterdam, Enschedé, . . .

Machine patrix engraving continued into the 20th Century
Compositype, [probably Lanston], . . .
[need to find more evidence and more closely examine what we know]

Machine punchcutting remained important, esp. for matrix manufacturers.
Machine matrix engraving became important (esp. at ATF)

Pantographs from two major, and some minor, traditions:
♦ Single-arm machines derived from Benton
♦ 4-bar machines — Wiebking, “Gursch/Mahr” style, [Gorton?], . . .
♦ Goudy’s E&PM, Duensing’s Preis, Rimmer’s Ogata, . . .

Despite hand methods, 20th century was the age of the pantograph.

Not everybody was happy about this.
It is worthwhile to understand why.
(caution)

I’ll be tangling two threads here:

‣ The mechanization of type-making at any size.

‣ The mechanical (or algorithmic) scaling of type.

It is difficult to untangle them, as they’re aspects of the same technological history.
Contemporary Opposition

(It just seemed wrong to transcribe Updike with modern digital lettering. So here is what he said as he set it, in *Printing Types* (1922), p. 11.)

But a design for a type alphabet that may be entirely successful for the size for which it is drawn, cannot be successfully applied to all other sizes of the same series. Each size is a law unto itself, and is often bettered by modifications in the original design made by the feeling and taste of the designer.

Parallels with other fields - there were common objections to the Reducing Machine in coining/minting. Here’s a relatively late example:

The greatest and indeed the most devastating innovation was the introduction in the late eighteenth century of the reducing machine. ... Ultimately, coins and medals depend ... upon working directly in the dies to produce toreutic qualities at a size and scale appropriate to them.”


(“toreutic” just means “metalworking”)
Contemporary Support

“The machine has not killed good craftsmanship; the machine in the hands of the craftsman is merely a more intricate tool than any that was available to the earlier worker, and enables him to carry out his own creative ideas more exactly than can be done when the work is passed into the hands of artisans ... [who] obviously cannot realize fully just what was in the type creator’s mind, and therefore cannot carry out the work absolutely in the spirit in which he worked.”

- Goudy. *Typologia*. (1940) [italics mine]

Modern comment in support of Reducing Machines:

“The reducing machine has been much blamed for the decline in standards of design and execution in modern coinage. This criticism is based on a confusion of ends and means, for the reducing machine in the hands of artists like Pistrucci and William Wyon was the mere servant of their skills, and did not diminish the quality of their work.”

- Pollard (1971): 317
Plan of Analysis

What is a “Typeface”?
Not a “natural” category.
The concept arose in the late 19th century.
You cannot understand type before ca. 1850-1870
by thinking in terms of typefaces.

This concept was a part of a general move to
regularize type in the late 19th century.
It predated the pantograph,
but the pantograph enabled its full expression.

Can you always scale type algorithmically?
Yes, you can, and
No, you can’t.

These are issues which arose out of the pantograph
and its successor, the computer.
The Evolution of the Concept of a “Typeface”

Today: A “typeface” is a design.

Covers many variations (size, weight, roman/italic, condensed/expanded, etc.)

But is essentially unified.

An expression of a designer’s intent.

Goudy. The first Type Designer as Rock Star
Bruce’s 1828 Specimen Book (1/2)

There are no typefaces in this specimen book.

Types not named.
Identified only by size.
In only a few styles.

In a few instances also numbered.
Sometimes effects called out (Shaded, Open)

There are type styles, but every size was cut separately. There are no typefaces.

Unusual/new/display types still distinguished only by name of style (Italian, Antique, Black)
Two Line Bourgeois would be about 18 point, Two Line Long Primer 20 point (= Paragon), and Two Line Small Pica maybe 22 point.

Cincinnati 1857 Specimen Book

The faces are just numbered in the order in which they were cut within each size. Size is still the basic feature, not design. We have since made typefaces out of some of these, but in 1857 the are still not being presented as typefaces.
Transition to “Typefaces” (1870s)

By the 1870 Cincinnati specimen book, they were organizing types into groups.

Sometimes these seem like typefaces.

Sometimes they’re just loosely related groups.
Typefaces as We Know Them (By 1895)

By (certainly before) the 1895/6 ATF “Collective” Specimen book:

Collections into named groups.

Cohesively developed series. Typefaces as we understand the term.
Other Regularizations


Standard Type Height (introduced with the point system).

Standard Line (associated with two of the primary advocates of pantographs):
♦ Claimed by Nicholas Werner as his invention.
♦ The Bentons and ATF “American Line” (by 1906).

Point Line (in ATF’s American Line; others?)

Unit Set:
♦ Precursors 1854 (Wiberg); 1880s (Thorp/Cleveland).
♦ Benton’s “Self-Spacing” Type (by 1884).
♦ Lanston Monotype (1890s).

Point Set (Inland 1899; ATF spacing material).
"Caslon went so far as to buy an existing type, cut 50 years before his time, for his Canon size; moreover, by modern standards we should hardly judge his 14-point [English] and 18-point [Great Primer] to be members of one family"

Opposition to Scaling: Harry Carter

His 1937 article “Optical Scale in Typefounding” has often been cited.

He does not argue that “optical scaling” can be done.

Instead, he argues that the “optical scale” in typefounding means that at times types should not be scaled at all.

“The design [of a type] must have beauty enough for large sizes and legibility enough for small ones; and these qualities must be stressed in appropriate degree for each size. Types which lack either good quality should only be cut in the sizes for which they are suitable.”

- Carter (1937): 6. [italics mine]
I’ll stop here in my ATF 2018 presentation.

What remains involves a bit more “hand waving.”

I try to go beyond arguments about type scaling to recover, for future development, Knuth’s idea from the early 1980s that the mechanization of type should be a way to allow us to better describe type, and thus better understand it...
That’s (almost) everything, plus...

Questions?