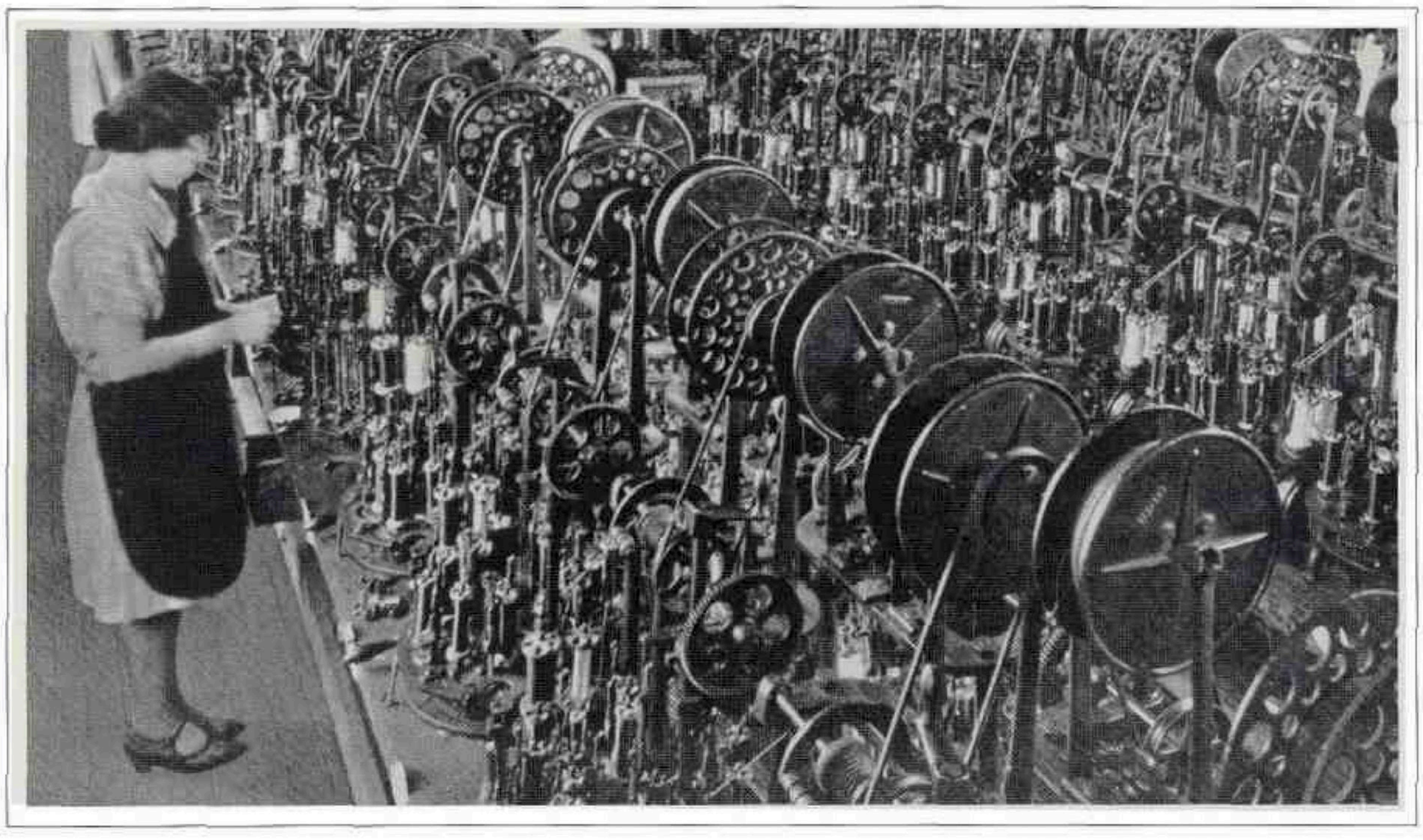
Silk Fly Line Manufacturing:



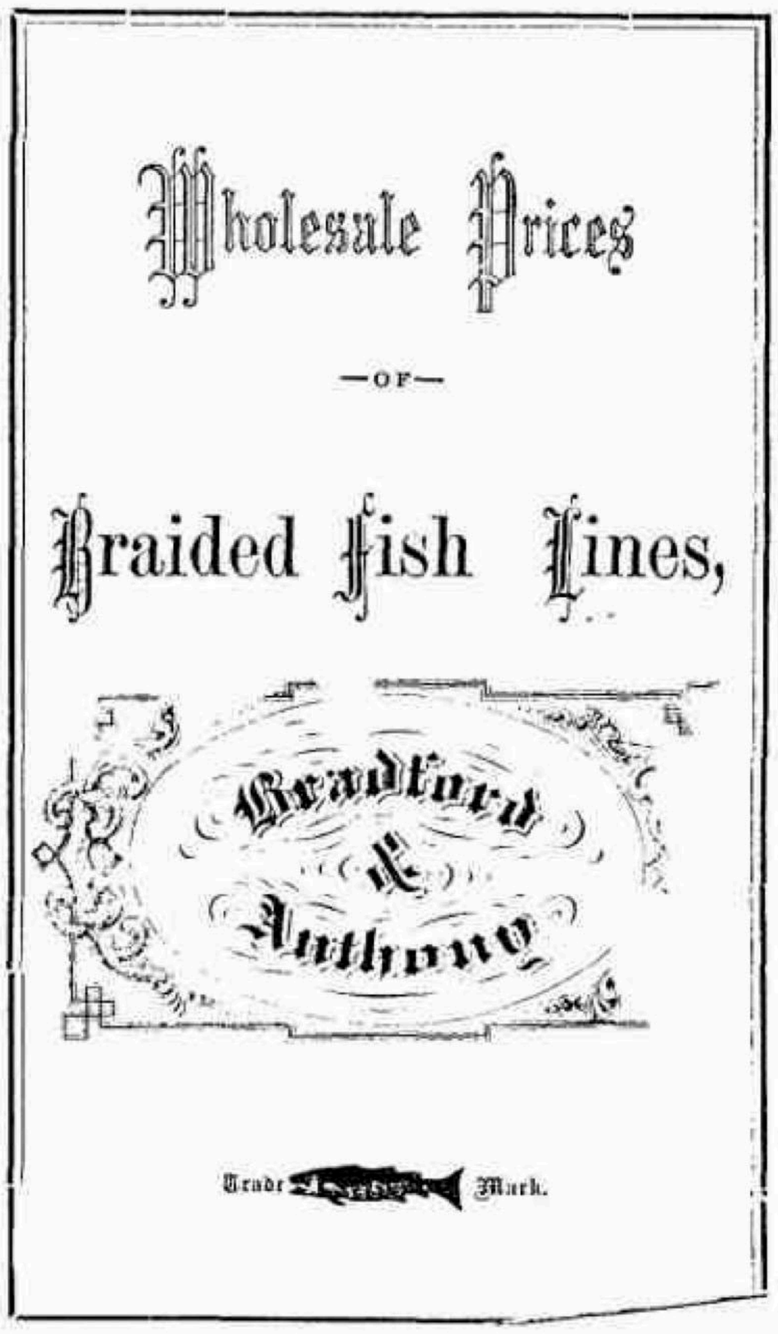
A Brief History

by John Mundt

THE PRACTICE OF USING fly lines made of horse hair and silk is well documented in the lore of angling, however, information on the actual manufacture of these lines is much more limited. Early English publications, such as *A Treatyse of Fishing with an Angle* (1496), author undocumented but popularly attributed to Dame Juliana Berners, and *The Compleat Angler or The Contemplative Man's Recreation* (1653), by Izaak Walton and Charles Cotton, provided detailed instructions on how to fabricate lines made of horse hair, as well as other tackle. From the fifteenth through the seventeenth centuries there was no firmly established tackle industry, thus prospective anglers had to rely on these and other reference books in order to equip themselves. As the tackle industry developed over several centuries, an angler no longer had to produce his or her own tackle, but could readily purchase the required items. When the market grew enough so that demand could be met, published material on how to make lines diminished and what had been published was not always archived. This explains why there is only nominal documentation on the subject available today.

By tracing the evolution of the fly line, it is possible to gain a more detailed perspective on the construction methods used over the ages. *The Compleat Angler* by Walton and Cotton (fourth London edition) gives the reader instructions on how to properly select and prepare horse hair for weaving or "twisting" into a functional line. This classic volume goes a step further by describing the various methods of "dyeing your hairs." In the following passage Sir Izaak instructs the reader how to collect raw material and prepare it for assembly into a line.

> And for making your line, observe this rule, first let your hair be clean washed ere you go about to twist it: and then choose not only the cleanest hair for it, but hairs that be of equal bigness, for such do usually stretch all together, which hairs of unequal bigness never do, but break singly, and so deceive the Angler that trusts to them . . .
>
> When you have twisted your links, lay them in water for a quarter of an hour at least, and then twist them over again before you tie them into a line.



Opposite: The Cortland Line Company began mass producing silk fly lines in the early 1930s using silk filaments imported directly from Japan. The efficient braiding machines (as shown in Cortland's 1932-1933 catalog) still required ninety-six total thread changes in the eight hours it took to complete a single 90-foot line. Catalog courtesy Leon Chandler.

Later in the book, Charles Cotton details the ideal specifications for a line.

> Now to have your line as it ought to be, two of the first lengths nearest to the hook should be of two hairs a-piece; the next three lengths above them of three; the next three above them of four; and so of five, and six and seven to the very top.

This taper would develop by gradually increasing the number of hairs utilized as the line diameter progressed through a total of seventeen separate sections.

In dressing or "dyeing" the lines, Sir Izaak recommended a concise mixture of " . . . a pint of strong ale, half a pound of soot, and a little quantity of the juice of walnut-tree leaves, and an equal amount of alum." After boiling and cooling this concoction, a line would be immersed in it until it would "turn [the] hair to be a kind of grass-colour, or greenish." The longer the line was soaked the darker it would become. We are advised that pale green is the most favorable shade, and that one should use a yellow line only "when the leaves rot."

In early American periodicals of the 1700s, advertisements by "Edward Pole — Fishing Tackle Maker" mentioned "ready money for white horse hair."[1] This would indicate that raw materials were being acquired in the United States to manufacture lines and leader material. Another Pole advertisement that appeared in 1777 mentioned that he marketed "the best green or white hair, silk, hardest, hempen, flaxen, and cotton lines": he was simultaneously marketing horse hair, silk, and cotton lines. One can only speculate that Mr. Pole himself made these lines by hand with the use of the simple tools available at the time. During these early years of line making, each line was essentially a unique item which adhered to no established manufacturing standards.

For the next seventy-five years the fly line continued to evolve until silk became the only material available in mid- to late-nineteenth century catalogs.[2] Charles Orvis's personal scrapbook of 1870–1900 (in the Museum's collections) includes two catalogs that offer silk lines.[3] The first was published by Bradford & Anthony and reads "Wholesale Prices of Braided Fish Lines." The second is more specific, offering "Flexible Waterproof Silk Lines"

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"It is important that the size of the line should be adapted to the rod. A heavy line on a very light rod would be bad; a very light line on a heavy rod would be worse. I find many are inclined to use too light a line, supposing the lighter it is the less trouble there will be in casting it. This, I think, is an error. It is impossible to cast well against or across the wind with a very light line; and very light lines do not 'lay out' as accurately as do the heavier ones."

CHARLES F. ORVIS.

FINEST QUALITY FISHING LINES.

Braided Lines on Blocks.

G.
F.
E.
D.
C.
B.

Finest Quality Tapered Fly Lines.

TAPER F.
" E.
" D.
" C.

Enamelled Waterproof, Braided Silk Tapered Fly Lines: Finest Quality Made.

Size D.	50 yards,	$4.00;	40 yards,	$3.20;	30 yards,	$2.40;	25 yards,	$2.00 each,
" E.	40 "	2.80;	35 "	2.45;	30 "	2.10;	25 "	1.75 each.
" F.	40 "	2.80;	35 "	2.45;	30 "	2.10;	25 "	1.75 each.

Level Lines.—D. 8c., E. 7c., F. 6c., G. and H., 5c. per yard.

Level lines are in 25-yard lengths, 4 connecting.

Salmon Tapered Fly Lines.

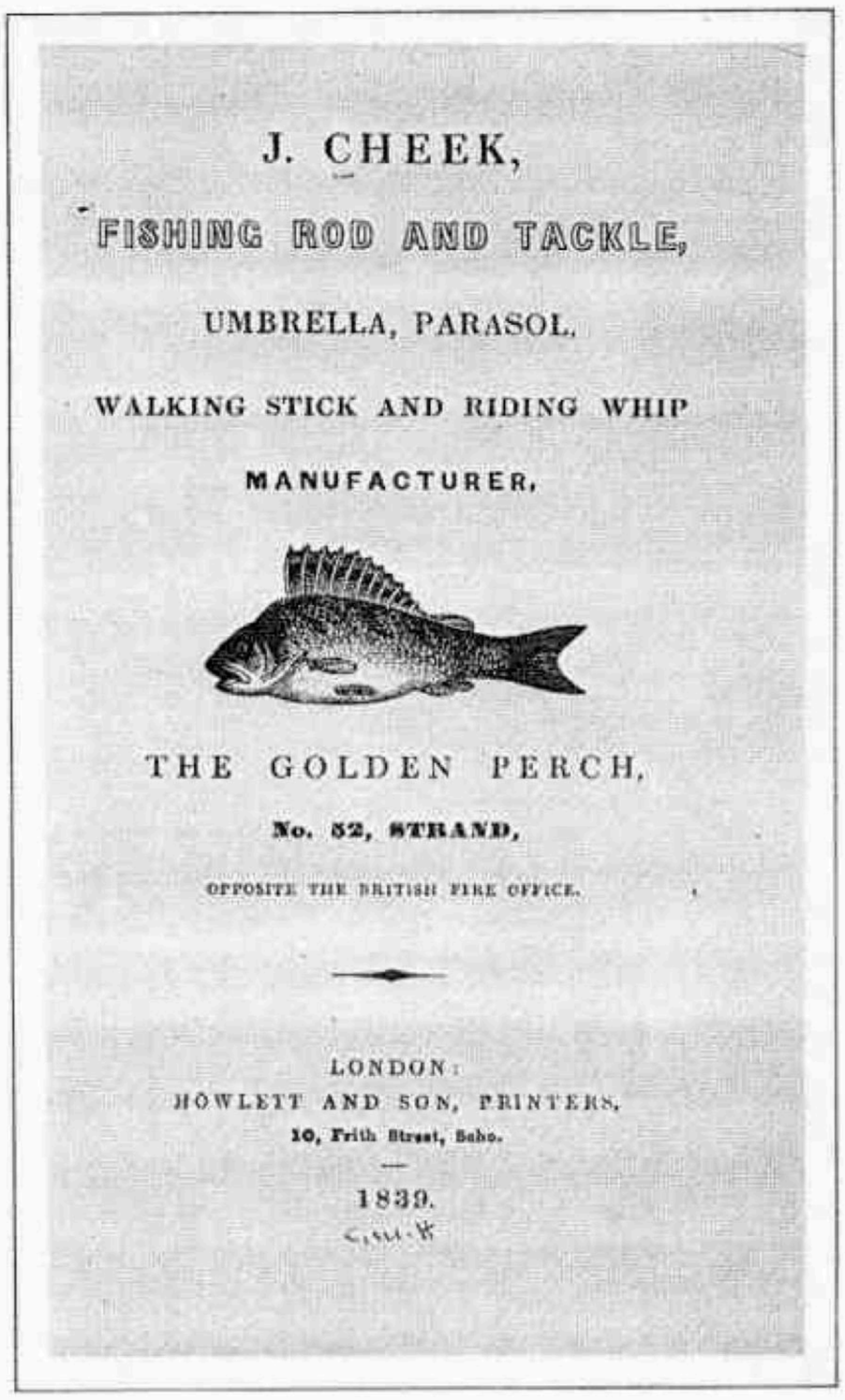
Size B.	100 yards,	- -	$11.00 each.	Size B.	120 yards.	- -	$12.50 each.
" C.	100 "	- - -	9.50 "	" C.	120 "	- - -	11.00 "
" D.	100 "	- -	8.50 "	" D.	120 "	- - -	10.00 "

that were manufactured by John Shields & Company of Brookline, Massachusetts. An Orvis catalog shows that they marketed silk lines under their own label as early as 1889.[4] And J. Cheek of London, "Manufacturer of Walking Sticks and Riding Whips," made rod and silk lines for sale through his 1839 catalog.[5]

The J. Cheek catalog reference is significant because it shows that Mr. Cheek was proficient in whip braiding, an early technique in the evolution of silk line manufacturing. More efficient textile manufacturing methods were implemented during the industrial revolution, and it is presumed that automated silk line production was derived from this technology, affording it much greater availability. In hopes of learning more about the actual manufacture of silk lines, interviews were conducted with two gentlemen who have had firsthand experience with mechanized silk-line production.

The Cortland Line Company was founded in 1915 under the leadership of Ray F. Smith, in Cortland, New York, and began mass producing silk fly lines in the early 1930s. Leon Chandler, president of the company, recalled in an interview how silk filaments were imported directly from Japan and were then built into threads by doubling and twisting at Cortland's mill. This thread was given to a Cortland operator who worked on a modified braiding machine. To produce a double taper line, the operator would begin with sixteen small threads at the line tip and develop the gradual taper by removing the smaller threads and replacing them by splicing in larger threads until the body of the line was formed. This process was then reversed to complete the tailing taper. Ninety-six total thread changes were required in order to complete a single line. The operator was responsible for eight machines, completing one 90-foot line per machine in an eight-hour shift. The production schedule called for two shifts: the first from 6:00 A.M. to 2:00 P.M., and the second from 2:00 to 10:00 P.M.

After the braiding was completed, the lines would undergo an oil impregnation process during which a continuous row of lines would be drawn through a blend of tongue and linseed oils and then fed into a two-story oven for drying. This impregnating process would be repeated a number of times. Once dry, a grinder was used to remove the excess oil buildup on the outside surface of the line. The entire manufacturing process would take


J. CHEEK,

FISHING ROD AND TACKLE,

UMBRELLA, PARASOL,

WALKING STICK AND RIDING WHIP

MANUFACTURER,

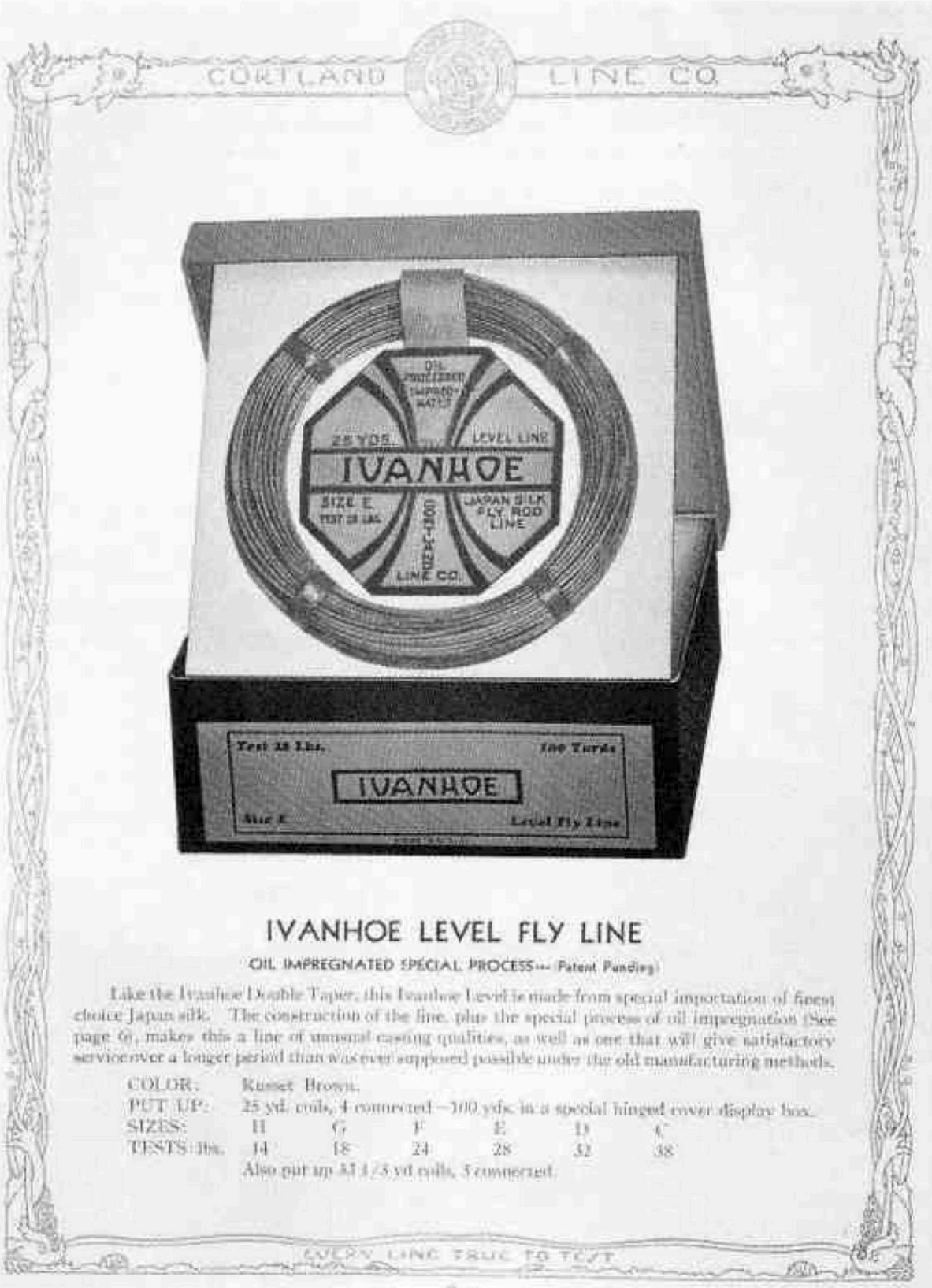
THE GOLDEN PERCH,

No. 52, STRAND,

OPPOSITE THE BRITISH FIRE OFFICE.

LONDON:
HOWLETT AND SON, PRINTERS,
10, Frith Street, Soho.

1839.



IVANHOE LEVEL FLY LINE

OIL IMPREGNATED SPECIAL PROCESS— Patent Pending

Like the Ivanhoe Double Taper, this Ivanhoe Level is made from special importation of finest choice Japan silk. The construction of the line, plus the special process of oil impregnation (See page 6), makes this a line of unusual casting qualities, as well as one that will give satisfactory service over a longer period than was ever supposed possible under the old manufacturing methods.

COLOR:	Russet Brown.					
PUT UP:	25 yd. coils, 4 connected—100 yds. in a special hinged cover display box.					
SIZES:	H	G	F	E	D	C
TESTS: lbs.	14	18	24	28	32	38

Also put up 33 1/3 yd coils, 3 connected.

— 9 —

several days to complete. Ivanhoe silk lines were one of Cortland's earliest introductions.

Chet Cook of the U.S. Line Company of Westfield, Massachusetts, was involved with silk line production from the mid-1940s through the early 1960s. U. S. Line was originally known as the U. S. Whip Company (another example of how silk line production evolved from whip making). They were once the largest manufacturer of whips in the world and helped Westfield earn its reputation as the Whip City. But when the automobile came into widespread use, they had to adapt their product line in order to survive. Company management assumed that they could readily convert their braiding equipment from whipmaking to fishing line production. Unfortunately, this was not the case, so they purchased the necessary equipment and began operation as the U. S. Line Company.

Chet recalls in an interview that U. S. Line purchased its silk directly from Japan and had it refined and spun into thread by the now defunct Mason Silk Company of Winsted, Connecticut. Each thread was built by twisting three filaments into a strand and then twisting the three strands together to form a working thread. Sixteen threads were needed to braid a line.

The factory assigned 100 out of 600 braiding machines to tapered fly line production; the remainder were used for bait casting and trolling lines. Each operator working on fly lines was responsible for five machines. On these machines, mechanized counters would feed specified amounts of thread into production and then shut off, enabling the operator to splice in the various sized threads required for developing the taper.

As each line was completed, a colored marker was tied in and the operator would begin the next line; up to thirty lines were braided in one continuous length. This parade of lines was wound onto a skein that was then dipped into boiling linseed oil for impregnating. They were drip dried by rotating the skein every half hour for several hours, and were dried further by being placed in a 200-degree oven for four hours.

After sitting for a day, they were honed by being fed over a curved metal disk that would rotate in place. The lines went through this entire process six or seven times until a smooth surface was achieved. When hand and visual inspections of the final finish were complete, the lines would be coiled as they were unwound from the skeins. Workers would then remove the thread marker that was tied in during braiding and cut the individual lines off.

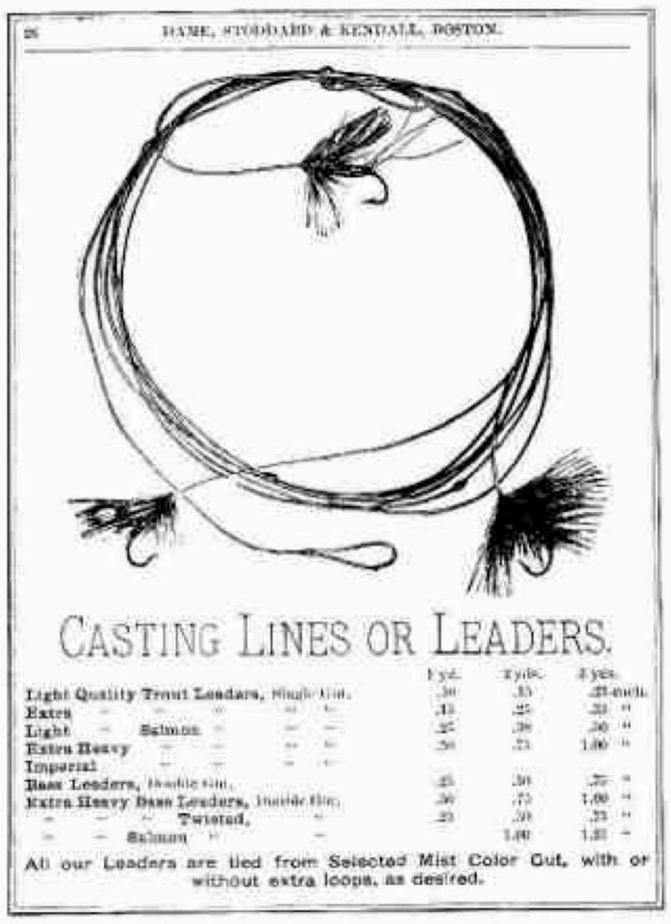
Although Cortland and U. S. Line began mass producing silk lines during the early 1930s, lines made by similar processes were being marketed by Abercrombie & Fitch as early as 1911. These lines were produced according to the British "Halford Process," in which a braided silk line was immersed in a container of boiling linseed oil and kauri gum varnish.[6] The container was sealed and had the air pressure within it reduced with a pump. By reducing the pressure, air was able to escape from the line so that when the pressure was brought back to normal, oil would penetrate the line. A smooth surface was achieved by repeated coating and drying. The excess coating was removed by hand with a pumice stone and the line was polished with talcum powder. These and many other lines made of silk were marketed during the late nineteenth and early twentieth centuries.

Silk line specifications were based on an alphabetical system, believed to be British in origin, each letter designating the diameter of the line tapers.[7] For example, an HDH line had a front taper of 25/1,000 of an inch, 45/1,000 inch body, and an end taper of 25/1,000 of an inch. A CBC was 30/1,000 inch, 55/1,000 inch, and 30/1,000 inch. Thus B signifies 55/1,000 of an inch; C is 30/1,000; D is 45/1,000; and H is 25/1,000. This gauging system was widely accepted by line manufacturers of the day.

Smooth as Silk

LOOKING AT THE AMERICAN angling experience, one of the first references to silk fly lines is a 1777 advertisement of Edward Pole, a self-described "Fishing Tackle Maker" who offered "Silk, Hair, and other Lines of every kind, length and Degree of Goodness." Of course, horse hair was a material used in the earliest lines, but as this advertisement demonstrates, silk was being used by the colonial angler. It is also interesting to note that silk lines get top billing in this eighteenth-century advertisement.

The early silk lines were not braided. Instead, the individual strands of silk were merely twisted together in order to create the thicker line and increase its total strength. Two types of silk were generally available, one being *raw* and the other *boiled*. Raw silk, as the term implies, was used exactly as it came from the worm: the finished line being rough and gummy to the touch. Boiled silk, on the other hand, described the distillation process used to remove the natural "gum" from the silk. This boiling, however, left a fiber thinner in diameter than the raw silk. As a result, more individual boiled fibers were required to make a line of equal diameter to a similar line of raw silk. Although the boiling procedure, and the added materials required to make boiled silk line, certainly drove up the cost of the finished product, it was discovered that the additional fibers produced a stronger line. It was further discovered that boiling the silk fibers yielded far more supple lines than their raw silk counterparts, but this led to a curious problem described by Henry Wells in *Fly Rods and Fly Tackle*. It seems that even though boiled silk line had greater strength than that made of raw silk, its suppleness resulted in a good deal of tangling around the tip of the rod. This, he related, was quite a problem for the wading angler who, while in midstream, would have the formidable challenge of untangling his outfit. Remember, the average nineteenth-century rod was 12 or 13 feet in length.


DAME, STODDARD & KENDALL, BOSTON.

CASTING LINES OR LEADERS.

	1 yd.	2 yds.	4 yds.
Light Quality Trout Leaders, Single Gut,	.30	.35	.25 each.
Extra " " " "	.35	.45	.35 "
Light " Salmon " "	.35	.38	.50 "
Extra Heavy " " "	.50	.75	1.00 "
Imperial " " "			
Base Leaders, Double Gut,	.25	.30	.25 "
Extra Heavy Base Leaders, Double Gut,	.30	.75	1.00 "
" " " Twisted, "	.25	.50	.25 "
" " Salmon " "		1.00	1.25 "

All our Leaders are tied from Selected Mist Color Gut, with or without extra loops, as desired.

An early Dame, Stoddard and Kendall catalog (pre-1890) lists lines of both raw and "oiled" silk. The latter line was surely the boiled variety, "oiled" being a reference to the oils or varnishes applied to the silk at the end of the manufacturing process. This covering helped increase the longevity and buoyancy of the line. A later Dame, Stoddard, and Company catalog no longer listed the raw silk line, and the term "enameled" replaced "oiled."

Charles Orvis, in a catalog from the late 1880s, offered only braided enamelled lines. These came either tapered or level, and were available in a variety of lengths. The Salmon Tapered Fly Lines could be purchased in lengths of 100 and 120 yards. In none of the early catalogs can I find a product we would refer to as fly line backing (of course, this isn't to say that something to serve this purpose didn't exist). In the early 1900s, an Abercrombie & Fitch catalog did mention "backing" in conjunction with salmon lines, but this product wasn't described. For the most part, an early fly fisher wanting to pursue big fish would purchase a large spool of level fly line and splice this into the back end of his casting line. This long level line would act as the backing, and, as Kelson described in *The Salmon Fly*, would serve to fill up the "winch." Of such importance to the salmon angler, Kelson gave careful instructions on how to securely braid a backing to the general casting line.

Though the name Kosmic is more closely associated with the manufacture of fine reels and exquisite rods, this company also offered equally fine double tapered and level lines in various lengths. Kosmic, like so many other companies who offered lines, sold these complementary products under its own name; there

is rarely any mention as to the *actual* manufacturer. Even William Mills and Son, Abercrombie & Fitch, and Dame, Stoddard, and Kendall give little indication as to whose product you were really buying.

In an early twentieth-century Hardy

The demise of the silk line began during World War II when nylon was introduced. The product of chemical and scientific breakthroughs, introduced by the E. I. DuPont De Nemours & Company, Inc., nylon was less expensive and easier to produce. Nylon's major shortcoming was that it did not hold the impregnating oils as well as silk. This problem was solved by coating a level line with synthetic repellent materials that were then molded to the desired tapers. The technology behind the development of nylon lines was the direct result of ideas that grew out of the manufacture and use of horse hair and silk lines — lines which play a proud and innovative role in angling history.

ENDNOTES

1. "Edward Pole: Fishing Tackle Maker," advertisement appearing in *The American Fly Fisher*, vol. 6, no. 1 (Winter 1979, p.6.

2. Izaak Walton and Charles Cotton, *The Compleat Angler or The Contemplative Man's Recreation*, fourth London edition (New York: Thomas Y. Crowell & Co.), pp. 245, 246, 348; Samuel Mellner and Herman Kessler, eds., *Great Fishing Tackle Catalogs of the Golden Age* (New York: Crown Publishers, 1972), illustration, p. 65.

3. "Charlie's Scrapbook," *The American Fly Fisher*, vol. 8, no. 3 (Summer 1981), pp. 24, 26.

4. *Great Fishing Tackle Catalogs*, p. 58.

5. *Ibid*, p. 3.

6. *Ibid*, p. 218.

7. Leon Chandler, "Fly Lines That Really Float," *Trout* (Autumn 1989), p. 78

Brothers catalog, one can find a very wide range of silk lines sold under the name Corona. The "Corona Superba" were double tapered lines 30 yards long, and the "Level 'Corona' Salmon Lines" were available in 50-yard lengths. Far more interesting, however, was the "Filip," described in the Hardy catalog as "Special Tapered Salmon and Trout Fly Lines." Quoting from the catalog, "Roughly the idea is, that a longer foreline can be thrown when 'shooting,' owing to the special form of back taper, and the fact that the principal weight of the line is nearer the fly." Undoubtedly, the "Filip" was one of the first commercially available weight-forward lines.

Many of us have come to believe that the silk line was a cantankerous piece of tackle requiring an inordinate amount of care, and that once nylon line became available, everyone happily stripped those old silks off their reels and replaced them with the new "wonder" lines. After all, who would want to spend their time dressing a line with a floatant if such a tedious procedure could be eliminated? And with the new synthetic lines, one no longer had to worry about forgetting to take the line off of the reel in order to assure proper drying.

Noel Buxton, of West Midlands, England, is to my knowledge the only maker of silk fly lines in the world today.

In his literature I learned that to entirely braid a line takes roughly forty-five minutes using machines especially designed for the task. Over the course of the next eight weeks, the braided line is dyed either olive green or a straw yellow, and all of the necessary varnishes are applied to it. During this time Mr. Buxton also proofs each line to assure that it conforms to American Fishing Tackle Manufacturers Association specifications for line weight. His lines come in double tapers, which are 30 yards in length, line weights one through nine. He also makes a 40-yard salmon line in sizes nine through twelve.

The Phoenix line, a four-weight in a

lovely straw color, is a joy to use. On my first trip with the line, I pulled the car onto the side of the road along the Little River in the Great Smoky Mountains where the rhododendron leans out over the water by about 4 feet. The stream had a medium flow that day, which left about a 2-foot space between the surface of the water and the bottom of the foliage. The fish usually lie along the undercut bank, and, well, you know the rest. It's a very challenging problem, but one that the Phoenix line handled beautifully. I've used the line many times since, and I always remove a dozen or so coils from the reel when I return and hang them on a peg in order to assure proper drying. The next day, I quickly dress the loose coils with the proper floatant that came with the line. By that afternoon, about twenty-four hours later, the line is ready to go.

Linen, hair, and silk are the materials that made up the lines which connected early anglers to their quarry. Over the years, countless hours have been spent by untold numbers of inventive anglers to produce superior casting lines. Fortunately, today's anglers can still cast a traditional silk line on their favorite waters. And it is hoped that we who take responsibility for our sport begin to pay a little more attention to those who seek the small improvements in our tackle, and in our angling enjoyment.

DAVID R. KLAUSMEYER

Illustrations from Samuel Mellner and Herman Kessler, eds., *Great Fishing Tackle Catalogs of the Golden Age* (New York: Crown Publishers, 1972), pp. 9, 11, 95, 131, 251.