TELEGRAPHING WITHOUT WIRES.

The *N. Y. Herald* publishes a long cock-and-bull story from a correspondent at Tonawanda, N. Y., detailing the marvelous discovery of a young man "of modest mien" in that town, of the name of James H. Mower. The invention purports to be an electrical screw or a method of telegraphing without wires. The account states that, after going through secret studies of electricity, chemistry, and all the sciences for three years, during which he encountered difficulties the mere mention of which would occupy two columns of our paper, this modest young man emerges from his obscurity and makes a trial of his invention on Lake Ontario with a pair of the newly-discovered apparatuses. These were each sunk in 25 feet of water, and placed 25 miles apart, in an exact mathematical straight line, extending precisely east and west. The parallel was obtained from the most accurate surveys by a skilled astronomer, because the slightest variation from the true line would have been fatal to success. The precise nature of the apparatus used is not stated; but we are told that, by means of a remarkable electrical machine of his own getting up, "but of too intricate a character to be described here," he generates an immense quantity "of a fluid of astonishing qualities, possessing all the desirable requisites to a quick and thorough decomposition of water."

"On the 10th of July, everything was got in position, the weather being calm and the water smooth. A scow from which to operate was anchored at each end. He then commenced to generate a powerful stream and an immense quantity of the decomposing fluid, which he stood ready to let loose upon the susceptible medium, a hundred radiating agents converging to a common center, all charged with electricity, and which were only waiting for the needed touch to speed the fluid upon its impulsive errand. At seventeen minutes past two o'clock he handled the operating screw and sent the following dispatch:

"'J. B. SPEARMAN—
"'Success at last is mine. JAMES H. MOWER.'

"At nineteen minutes past two o'clock, back came the response:

"'MR. MOWER—
"'The world will acknowledge your triumph. J. B. SPEARMAN.'

"Two hours were then spent in uninterrupted communication upon matters relating chiefly to the apparatus, its operations and disposition.

"As to the whole evolution of dispatching messages through water, using it as the only medium, without the aid of any wire or insulated conductor, it may be explained thus: The water at the point of contact with the fluid is decomposed in the first drop, when the chemical separation advances to the second globule and there effects a like change, communicating the evolution to the third, and so on in the line of transmission, always in the same stratum of water. Why this line of invariable decomposition is always east and west, Mr. Mower, as I remarked before, will not now disclose.

"It is impossible to overestimate the importance of this discovery—a discovery which will establish a perfect gridiron of ocean telegraphs between our Atlantic coast and Europe on the one hand, and the Pacific coast and China on the other. Obscure islands in the most neglected corners of the earth will be able to hold converse with civilization, and soon receive her quickening breath of industry and art. Every respectable seacoast newspaper can open its own channels of communication at an expense insignificant when compared with the present transatlantic rates. A thousand benefits will accrue to mankind, and it is hoped that, in their full fruition, the name of Mower will not be forgotten, for he has, indeed, electrified the world."

The suggestion of a telegraph without wires is very old. Our modest young man might have saved himself the labor of writing up his silly yarn, and given the pith of his story in much better style, by quoting, as follows, from Addison's article in the *Spectator*, published over 150 years ago:

"Strada, in one of his prolusions, gives an account of a chimerical correspondence between two friends, by the help of a certain loadstone which had such virtue in it, that if it touched two several needles, when one of the needles so touched began to move, the other, though at never so great a distance, moved at the same time, and in the same manner. He tells us that two friends, being each possessed of one of these needles, made a kind of dial plate, inscribing it with the four and twenty letters. They then fixed one of the needles on each of these plates in such a manner that it could move round without impediment. Upon their separating from one another into distant countries, they agreed to withdraw themselves into their closets at a certain hour of the day, and to converse by means of this their invention. Accordingly, when they were some hundred miles asunder, each of them shut himself up in his closet at the time appointed, and immediately cast his eye upon his dial plate. If he had a mind to write anything to his friend, he directed his needle to every letter that formed the words which he had occasion for, making a little pause at the end of every word or sentence, to avoid confusion. The friend in the meanwhile saw his own sympathetic needle moving of itself to every letter which that of his correspondent pointed at. By this means they talked together across a whole continent, and conveyed their thoughts to one another in an instant, over cities or mountains, seas or deserts."

Here is an almost exact description of Brett's needle telegraph as used for twenty years past in England, the essential difference being that, in order to make the two separated needles sympathetic, Mr. Bett is obliged to keep them constantly connected by means of a telegraph wire.

Rules for the Strength of Boilers.

The "Useful Information for Railway Men," written by Mr. W. G. Hamilton, for the Ramapo Wheel and Foundery Company, among many other valuable items of information, gives the following, regarding steam boilers. For the cylindrical parts:

To Find the Working Steam Pressure Due to a given Diameter, Thickness of Plate, and Quality of Joint:—RULE—Multiply thickness of plate in inches by 2, and by the working strength of the longitudinal joint in pounds, per square inch, and divide by the diameter in inches; quotient is working steam-pressure in pounds, per square inch.

To Find Thickness of Plate, Due to a given Diameter, Quality of Joint, and Working Pressure:—Multiply the working pressure in pounds, per square inch, by the diameter in inches, and divide the product by the working strength of the longitudinal joint in pounds, and by 2. The final quotient is the required thickness of plate in inches.

The ultimate or bursting pressure is five times the working pressure.

To Find Working Steam Pressure, Due to a given Diameter of Tie-Rod, and Area of Segment to be guarded by it:—Divide the working strength of the tie-rod in pounds, by the area of the segment in square inches; quotient is working steam pressure in pounds, per square inch.

To Find Thickness of Plates of Stayed Surfaces:—Multiply the square root of the pressure in pounds, per square inch, by the greatest distance between the stays in inches, and by ·008; product equals thickness of plate in inches.

To Find Area of Segment, Due to a given Diameter of Tie-Rod and Working Pressure:—Divide the working strength of the tie-rod in pounds, by the working pressure in pounds, per square inch; quotient is area of segment in square inches. Working tensile strength of best iron rods is seven-eighths inch diameter, 8,000 pounds; one inch diameter, 10,000 pounds; one and one-eighth inches diameter, 13,000 pounds. Deduct ten per cent if the rod is reduced by screwing.

To Find Dimensions of Stay Bolts:—Multiply area supported by stay in square inches by pressure of steam in pounds per square inch; the sum divided by 9,000 equals area of stay bolts in square inches, if the stay is thickened out where the screw is cut. If the screw is cut out of the body of the stay, divide by 6,000. Where stays are secured by keys, the stay at the end should be one and a quarter diameter of the body of the stay. Depth of cutter, 1·6 diameter of stay; thickness of cutter, 0·3 diameter of stay.

To Find Working Strength of a Roof-Stay (or Crown Bar) of given Dimensions, fixed in its Place:—Multiply thickness of stay at the center in inches, by the square of its depths at the center in inches, and by 30; divide the product by the length of the span in inches; quotient is working load in tuns equally distributed, when stay is fixed in its place.

Staying Locomotive Boilers.—Fire-Box Water Spaces:—Working pressure in pounds, per square inch, being one sixth of bursting pressure; stays, three-quarters inch diameter; copper plates, one-half inch thick; iron do., three-eighths inch thick.

STAY.	PLATE.		STAYS 5 IN. APART.	STAYS 4 IN. APART.
Copper	Copper	Screwed and riveted	107	185
Iron	Copper	Screwed and riveted	160	250
Iron	Copper	Screwed only	120	190
Iron	Iron	Screwed and riveted	185	290

For low pressure boilers, at twenty pounds per square inch flat portions should be stayed at intervals of twelve inches apart.

To Find the Pressure borne by the Roof-Stays (or Crown-Bars) of a Fire-Box:—Multiply span of the roof in inches, by the pitch of the stays in inches, and by the pressure in pounds per square inch, and divide by 2240; the product is the pressure uniformly distributed, borne by each roof-stay, in tuns.

Strength of Boiler Plates and Joints:—Working strength of best boiler plates are:

Yorkshire plates, per square inch of entire section	11,000	pounds.
Staffordshire	9,000	"
American	14,000	"
American, ordinary	12,000	"
Cast steel plates	18,000	"

Working Strength of Joint per Square Inch of Entire Section:

	BEST YORKSHIRE.	BEST STAFFORDSHIRE.	BEST AMERICAN.
Scarf-welded, joint	11,000	9,000	14,500
Double riveted, double welt	9,000	7,000	10,500
" " lap joint	8,000	6,500	9,750
Lap, welded joint	7,400	6,000	9,000
Double riveted, single welt	7,300	6,000	9,000
Single riveted lap	6,700	5,400	7,800

The strain per unit of length upon transverse circular joints is only half of that on longitudinal joints; longitudinal seams should therefore be the strongest, and the double-riveted double welt joints should be used for longitudinal joints, and the single-riveted lap joints for circular seams.

Riveting for Boilers.—Table of Dimensions of Rivets, etc., for Steam Boilers:

Thickness of Plate.	Diameter of Rivet.	Length of Rivet from head.	Distance apart of Rivets, Center to Center.	Breadth of lap, single riveting.
in.	n.	n.	in.	in.
3-16	⅜	⅝	1¼	1¼
¼	½	1⅛	1½	1½
5-16	⅝	1⅜	1⅝	1⅞
⅜	¾	1⅝	1¾	2
½	13-16	2¼	2	2¼
⅝	15-16	2¾	2½	2¾
¾	1¼	3¼	3	3¼

For double-riveted joints, add two thirds of the breadth of lap.

MR. RECHTEN, of Bremen, has been exhibiting the newly patented German whaling gun at New Bedford. The gun is double and very heavy, mounted on trunnions. One barrel is designed for a harpoon and the other for a bomb lance. The harpoon is said to have been thrown a long distance with great accuracy.

THE BESSEMER PROCESS—HOW ITS EARLY DIFFICULTIES WERE OVERCOME.

Before considering the conduct of the Bessemer process, i is necessary to bear in mind, 1st, that the grand value of Bessemer metal over puddled metal, is due to its being produced in a fluid state; 2d, that while cast iron is easily liquefied at a temperature of 3,000°, wrought iron or soft steel can only be kept liquid at a temperature of at least 5,000°, which is quite beyond the convenient and practicable capacities of fuel and furnace material as ordinarily employed.

For nearly a century, the partial decarburization of pig iron has been accomplished by blowing air upon (and in some cases into) a melted mass of it. But the liquidity of the mass was only maintained by contact with an intense coal fire. The combustion of the carbon by the air was so slow and so limited in extent, that the iron was rather chilled than heated by it. This was the "finery" process, and was merely preparatory to puddling; the product was still cast iron.

Some years before Bessemer began his experiments, Mr. William Kelly of Kentucky advanced the finery process by a great stride, but left it still far short of practical steel making. He blew air into the iron just smelted from the ore, and lying in the hearth of a blast furnace, and partially decarburized it, but not without the liquefying agency of the mass of fuel above. He afterwards blew streams of air into melted iron contained in a covered brick vessel or chamber, without fuel. The almost invariable chilling of the iron, after repeated experiments with various forms of apparatus, and extending over several years, led to the suspension of further trial in this direction. The subsequent success of the Bessemer process, however, revived the claims of Mr. Kelly. The precise legal status of the two inventors has not, fortunately for the public as well as for the parties immediately interested, been brought to test, the various interests having been combined.

At this point we are prepared for the inquiry—What is the Bessemer process? If the old finery did not fulfill the theoretical specification, Kelly's certainly did. Here were carbon and silicium in the iron, but all ready to leave it upon the heated appeal of oxygen; here was plentiful oxygen spread over and bubbling through it, and here was the ample heat of three thousand degrees. Still, the reactions were irregular and impracticable.

Just here, Mr. Bessemer introduced a radically new element, that made all the difference between failure and success. To describe his process as the introduction of oxygen into melted iron, is to play Hamlet without the prince. Bessemer's is not strictly a chemical process. The chemical reactions will look out for themselves, but they must have an adequate chance, and this is what Bessemer for the first time gave them, by mechanical means, viz.: the mechanical force of numerous blasts—not sluggish drafts, but roaring blasts of air, blowing the melted iron all into spray, so as to give the oxygen and the carbon hundreds of square feet of surface contact, so that every drop of iron should be enveloped with air. Thus, and thus only, the combustion is so perfect and rapid, and so diffused throughout the whole mass, that the two grand desiderata are attained—1st, the decarburization is effected without the use of other fuel; and 2d, the product is liquid and can be cast into homogeneous masses.

To accomplish these results, Mr. Bessemer developed the radically new machinery and apparatus which, with various extensions and modifications, is everywhere used. It consists principally of the converting vessels mounted on trunnions, and so shaped that the liquid metal can lie quietly in it while the tweeres (air admission) and the entrance or mouth of the vessel lie above the metal line, and so that the mouth becomes a chimney and the tweeres are brought beneath the metal, when the converter is turned upright. He also, after great trouble, developed a refractory material (chiefly silicious stone), and a mode of lining the converter adequate to the great heat and wear. The general arrangement of casting pit, ladle, ladle and ingot cranes, regulator, and other plan to be hereinafter described, were rapidly developed by Mr. Bessemer. During ten years of his first practice, he advanced the machinery of the new art to a much higher degree of perfection than has yet been attained to in the old processes.

But Mr. Bessemer had no sooner conquered this difficulty than he encountered another and equally serious one. Except when a few of the choicer irons were employed, entire decarburization left the product "red-short," or incapable of malleability at red heat, and therefore utterly useless. To stop the blowing at such a point as should leave in sufficient carbon to cure the red-shortedness and constitute a mild steel, was on the whole impracticable, because there is no adequate indication of degrees in decarburization, and the accuracy of blowing through a fixed time, would be impaired by varying heat and other circumstances. Here, then, were the impossibility of definite degrees of decarburization on the one hand, and the spoiling of the product by complete decarburization on the other hand.

In studying Mr. Bessemer's numerous patents and writings, we observe that he clearly understood this difficulty, and approached very near to its solution. Indeed, he rather vaguely described, in several patents, perhaps without seeing the end from the beginning, substantially the remedy afterwards patented by Mr. Robert Mushet.

The indications of complete decarburization by blowing air into melted iron, are as distinct as the time of day on the clock. The flame at the converter mouth suddenly decreases in volume and loses—not its own brightness, but its power of illuminating other things. But the product is valueless. Mr. Bessemer vaguely conceived, and Mr. Mushet definitely specified the finishing touch in the great art—re-carburization. A definite weight (three or seven per centum) of a pig iron, containing not only carbon but manganese (either Franklinite or