clear span 30 feet, and weighed 44 cwt. and 3 qrs. Last observed deflexion, 3.03 inches, and breaking weight $57\frac{1}{2}$ tons. The deflexion of mine, under a load of 51 tons, (last measurement,) was $1\frac{5}{8}$ inch, and, under a load of $57\frac{1}{2}$ tons, it would not, at this rate, have exceeded $1\frac{1}{2}$ inch, or about one-half the deflexion of the tubular girder under the same amount of load. And, notwithstanding mine is *longest by three feet*, and weighs about *one-third less* than the other, yet mine was not injured by the strain of a load of 52 tons, while the other broke down under a load of $57\frac{1}{2}$ tons. Or, the tubular girder failed under about $25\frac{2}{3}$ times its own weight, while mine, with the disadvantage of 3 feet greater length—(this is a disadvantage when compared in this way)—stood under $30\frac{2}{3}$ times its own weight, without sustaining *any injury*. And, so far as the amount of deflexion indicates the measure of strain, it would seem that mine might stand under sixty times its own weight, or would bear over 100 tons. And, in order to determine fully as to all the merits, and strike the balance between the two girders, it becomes necessary to take into consideration the probable cost of labor and materials used in each. In mine is used one piece of cast iron, weighing 2820 pounds, and two malleable ties, weighing 630 pounds, in all=3450 pounds; while the tubular girder is presumed to have been made wholly of malleable iron, which is much more expensive than cast iron. Therefore, taking into consideration the difference between the first cost of 2820 pounds of cast iron in mine, and an equal amount of malleable iron in the other, (leaving the 630 pounds in my ties against an equal amount in the other,) and add the difference to the entire cost of the one-third greater weight of the tubular girder, together with the greater cost of labor in making the tube, and the difference will be one-third or one-half in favor of mine; and yet, as before shown, mine possesses nearly if not quite double the value of the other in strength.

I do not feel disposed to underrate the skill and scientific attainments of others, but the question of *girders* is an important one, and if I have succeeded in devising one of superior merit, its importance will be readily appreciated. If there are any errors in the form or construction of this girder, I wish them to be pointed out. It *can* be seen now, just as it came out of the trial. I wish some of the members of the Institute would come and make an examination.

Philadelphia, March 10, 1854.

*On Soap as a Means of Art.** By FERGUSON BRANSON, M.D., Sheffield.†

Several years ago I was endeavoring to find an easy substitute for wood engraving, or rather to find out a substance more readily cut than wood, and yet sufficiently firm to allow of a cast being taken from the surface when the design was finished, to be re-produced in type-metal

* Dr. Branson has also employed bees' wax, white wax, sealing wax, lacs, as well as other plastic bodies; and in some of these cases a heated steel knitting-needle, or point, was substituted for the ivory knitting-needle.—ED.

† From the London Artizan, February, 1854.

or by the electrotype process. After trying various substances, I at last hit upon one which at first promised success, viz., the very common substance called soap, but I found that much more skill than I possessed was required to cut the fine lines for surface printing. A very little experience with the material convinced me that, though it might not supply the place of wood for surface printing, it contained within itself the capability of being extensively applied to various useful and artistic processes in a manner hitherto unknown. Die-sinking is a tedious process, and no method of die-sinking, that I am aware of, admits of freedom of handling. A drawing may be executed with a hard point on a smooth piece of soap almost as readily, as freely, and in as short a time as an ordinary drawing with a lead pencil. Every touch thus produced is clear, sharp, and well defined. When the drawing is finished, a cast may be taken from the surface in plaster, or, better still, by pressing the soap firmly into heated gutta percha. In gutta percha several impressions may be taken without injuring the soap, so as to admit of "proofs" being taken and corrections made—a very valuable and practical good quality in soap. It will even bear being pressed into melted sealing wax without injury. I have never tried a sulphur mould, but I imagine an impression from the soap could easily be taken by that method. The accompanying specimens will show, that from the gutta percha or plaster cast thus obtained, a cast in brass, with the impression either sunk or in relief, can at once be taken. If sunk, a die is obtained capable of embossing paper or leather; if in relief, an *artistic* drawing in metal. This suggests a valuable application. The manufacturer may thus employ the most skillful artist to make the drawing on the soap, and a fac-simile of the actual touches of the artist can be reproduced in metal, paper, leather, gutta percha, or any other material capable of receiving an impression. By this means even high art can be applied in various ways—not a translation of the artist's work by another hand, as in die-sinking, but the veritable production of the artist himself. One of the specimens sent is a copy of Sir E. Landseer's "Highland Piper," a rude one, I must confess, though its rudeness does not militate against the principle involved in its production. Suppose the drawing had been made by Sir E. Landseer himself, that accomplished artist's actual drawing might have been embossed on various materials in common use, and disseminated amongst thousands, thus familiarizing the eyes of the public with high art, and giving a value to the embossed transcript which no translation by the die-sinker, however skilful, could possibly give it. The raised gutta percha impression of this specimen is from the soap itself; the sunk impression is cast in gutta percha from gutta percha. The works in metal, during the 14th, 15th, and 16th centuries, owe their excellence, in a great degree, to the combination in the same individual of artist and artisan. The metal was finished by the artist himself, who left the stamp of his genius unmistakably upon it. By the plan just explained, something like a return to this combination might be effected, and the artist would, at least, have the satisfaction of finding his own work accurately rendered, and not enfeebled, in the translation; for the art of casting in metal has of late been so much improved, that little difference can be detected between the impression on the cast and

the mould which produced it. I wish to lay particular stress upon the fact that *drawing touches* can be thus rendered, and an effect *rapidly* produced, unattainable by modelling. The larger plaster casts were taken from drawings freely made—as the appearance of the touches will prove—in common brown soap. The finer kind of soap is, of course, better fitted for fine work; but should the process now described be adopted by the manufacturer—and I trust it may never become the subject of any patent—soap better suited to the purpose than any now made will doubtless be specially manufactured. In proof that fine lines can be drawn upon the soap as well as broad vigorous touches, I can state that one of Rembrandt's etchings has been copied on soap, the soap pressed into gutta percha, and an electrotype taken from the gutta percha cast, from which a print has been obtained, very little inferior in delicacy to the original etching. Doubtless, persons engaged in manufactures will see applications of the process which I have not contemplated, and I leave it to their ingenuity to discover them. I would particularly call the attention of ornamental leather and paper manufacturers, bookbinders, and, possibly, manufacturers of china, to the process; for it must be remembered that soap, when made, can be run into moulds of any form, so as to obtain curved as well as flat surfaces for the artist to draw upon. It has also occurred to me that it would prove a very ready and expeditious method of forming raised maps, pictures, and diagrams for the use of the blind. The manipulation is very simple. A lead pencil drawing, if required, can readily be transferred to the smoothed surface of the soap, by placing the face of the drawing on the soap and rubbing the back of the paper; every line of the drawing is then distinctly visible on the soap. The implements used are equally simple: all the specimens sent were drawn with ivory knitting-needles, and small ivory netting-meshes for scooping out larger and deeper touches. The only caution necessary is to avoid under-cutting. Having felt the greatest interest in the establishment of schools of design, so well calculated to re-connect fine art with manufactures, it will afford me sincere gratification if the simple process now pointed out—and I trust its simplicity will be no bar to its being carefully tested—shall be in the smallest degree instrumental in accomplishing the re-union.

Sheffield, December 31st, 1853.

P.S.—The date 1850 is on some of the illustrative specimens.—*Journal of the Society of Arts.*

Identity of Dynamic or Voltaic Electricity with Static or Frictional Electricity. By Professor FARADAY.*

The Friday evening meetings for the season commenced at the Royal Institution on Friday last, the opening lecture being delivered by Professor Faraday to a very crowded audience. The subject was the development of electrical principles produced by the working of the electric telegraph. To illustrate the subject, there was an extensive apparatus of voltaic batteries, consisting of 450 pairs of plates, supplied by the Electric

*From the London Mechanics' Magazine, January 7.