

41 tempered sheet from a the magma film.

But any degree of temper that is given to feed makes a very important change in this respect. In the first place, it acquires magnetism more slowly by induction than an equal and similar piece of common iron, and its many acquired lets. These differences are only transcribed by the deviations which it causes in the manner's needle from the magnetic meridian, and by its attractive tions.

When the inducing magnet is removed, some magnetism remains in the fixed bar, which retains the polarity which, it will be the neighborhood of the matter.

Steel tempered to the degree fit for watch Springs acquires along magnetic which is exhibits immediate loss on the removal of the magnet. But it diffuses very fast ; and, in a very few minutes, it is reduced to less than one half of its strength while in contact with the magnet, and not two thirds of what it was directly on removal from it. It continues to diffuse for former days, though the bar be kept with care; but the diffusion diminishes at, and in the near at, half over third of its greatest power for any length of time, unless carefully kept or indjudicially treated.

Steel tempered into flowing cutting tools, such as chisels, punches, and drills for metal, acquires magnetism more slowly by induction, and acquires five of it while in contact with the magnet, but it retains it more firmly by, and finally retains a greater proportion of what it had acquired.

Steel made as hard as possible, is much longer in acquiring all the magnetism which simple juxtaposition can give to it. It acquires less than the formerly but it retains it with great firmness, and finally retains a much greater proportion.

Such one of iron as are susceptible of magnetism, are nearly like hard steel in their effects so that in the time necessary for their proper impregnation, and in the durability of the acquired magnetism. They exceed exceedingly in respect to the degree of power which they can attain by mere juxtaposition, and the varieties form to depend on heterogeneous mixture. We omit otherwise, thus far once of our ones of influence of of magnetism of the metal in the fate of my way, and combined with dolphins, are not magnetizable while remaining in that there. Most cases require reading, and a sort of cementation, in contact with inflammable substances. This matter is not underdefined, but it would form that complex metallization is far from being the north to voltaic condition, and that a certain degree of oxydation, and perhaps some other positive yet unknown, make the difference. Our all this is extremely obscure. The late Dr Cowin Knight made a comparison which required every phono and permanent magnetizing, but the recent died with him. Dr Gilbert speaks of limbal compositions, in which ferruginous days were ingredients ; but we know nothing of the fate of the metal in them, nor their mode of acquiring magnetism.

It is of peculiar importance to work that the acquisition of magnetization is gradual and progressive, and that the gradation is the more perceptible in proportion as the field is of a magnetic temper. When a magnet is brought to one end of a bar of common iron, to remote extremity, unless exceedingly long, requires its utmost

magnetism immediately. But when the north pole of

a magnet is applied: to one end of a bar of hard steel, the part in contact immediately becomes a fourth pole, and the far end is not yet affected. We observe a north pole formed a small difference from the concept, and present that a faint south pole. "Their gradually advance along the bar. The remote extremity becomes first a faint fourth pole, and it is not different very long while (if ever) that it becomes a simple, vigorous, north pole. More frequently it remains a difficult and recalcitrant north pole: may, if the bar be very long, it often happens that have a sacrifice of north and south poles, which never make their way to the far end of the bar. This phenomenon was first observed (we think) by Dr Brook Taylor, who in his account of his observations to the *Philosophical Transactions*, no 344.

From the account we have given of their phenomena to a steel indeed magnetized, it appears that the temporary because magnetism is always so dissipated that the rim of their mutual attractions of the diffused poles exceeds the gentle influence of the repulsion between the similar poles, and that therefore the two magnets tend to each other. This is evidently equivalent to saying, that a piece of magnetic iron is always attracted by a magnet. No exception has ever been observed to this fact, for Physic's duty of a Thales, or loadstones, which repels iron, is allowed by all to have been a false.

We think it allowable to say that this attraction of the loadstones for iron, or this tendency of iron to the loadstone, is a secondary phenomenon, and is the consequence of the proper disposition of the induced magnetism. The proofs already given of the compound matters of this phenomena, namely, that it arises from the excess of two attributions above two repetitions, need (we imagine) no addition. But the following considerations place the matter beyond doubt.

I. The magnetism of the two poles is evidently of an opposite nature; the one repelling what the other attracts. If the attracted iron, therefore, the other should result it. But each path, by changing a magnetism opposite to its own, on the nearest end of the iron, and the same with its own on the remote end, and its action diminishing with an increase of distance, there must always be an excess of attraction, and the iron must be attracted.

A. Each of the magnets A and B, in either of the positions represented in fig. 12. would alone attract the piece of common iron. But when placed together, the fourth pole of A tends to render the upper end of C a north pole; while the north pole of B tends to take it a South pole. If these actions be nearly equal, the weight of C cannot be supposed to be the magnetism induced by any difference of action that may remain. While C is hanging by itself alone, let A be gradually enough moved, it gradually thence the action of the north pole of B, so that C gradually loses its magnetism and polarity, and its weight preponderates.

§. In all three cases where the induction of magnetism is slow, the attraction is weak in proportion. This is particularly remarked by Dr Gilberts. If we take a piece of common iron, and of pieces of different temps, but all of the same fine and form, we shall find that the iron is much more thought attracted than any of the rest, and that the attraction for each of them a weaker proportion

as they are harder. This liberty is to accurately observed,
that when the piece is thoroughly

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