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Improved Shears for Plate Iron.

This engraving represents a very powerful pair of shears for cutting plate iron. The vast quantities of iron plates worked up into one form or another in this country, should render such a machine of the utmost value.

This machine is provided with its own motive power, and can be used on ship board, or out of the shop, as well as in it; at any point where steam can be had the machine can be used.

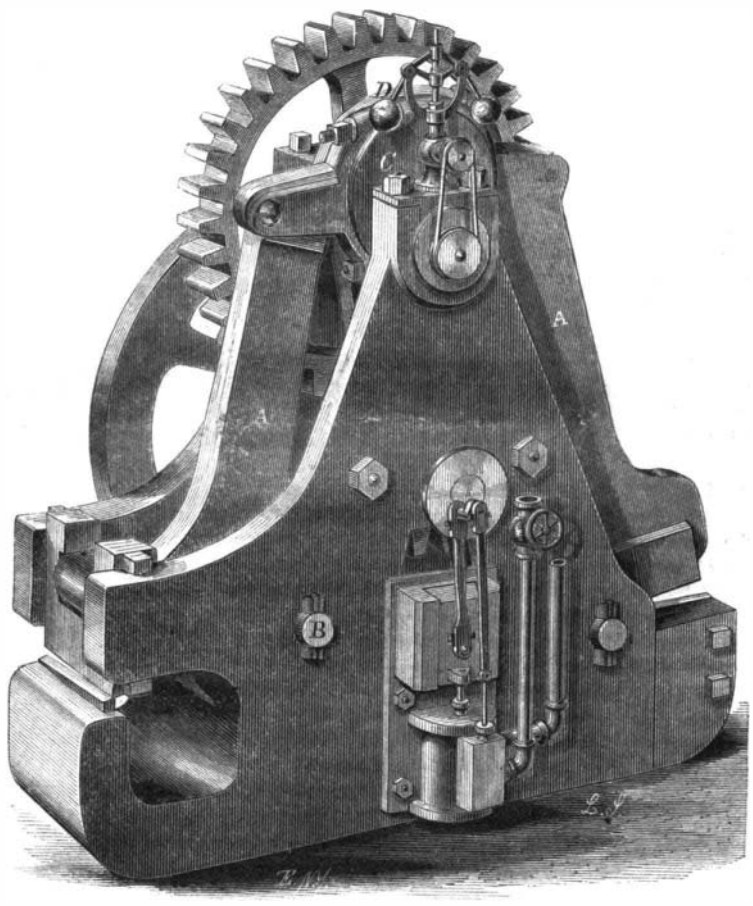
Aside from its massive strength and the convenience of having the power applied in the manner spoken of, it is well designed as regards durability and ease of access.

The mechanism consists of a pair of right-angled levers, A, vibrating on rock shafts, B, set and keyed fast in the frame. These levers are driven by an eccentric, C, against which they bear at the upper ends. The straps, D, on the eccentric take no portion of the strain, but are provided to draw the levers back to their positions; or, in other words, keep the ends up to the face of the eccentric.

The end thrust of the hub of the lever the shears are fastened to, is received by a brass washer which is recessed out on one side and brought up against the frame so that it is held and prevented from turning when the rock shaft moves. The washer renders the motion much more regular, and the tool may be easier kept in order than without it; it also keeps the shears up to their work, so that they are less liable to run off the line of cut. One end of the shears can be used for splitting long plates if necessary, while the other pair are set in a contrary direction so as to bring the shears within range of all kinds of work. It is equally well adapted for punching large holes, and from the nature of the combination of the several parts should be capable of doing very heavy work.

The engine shaft has a pinion on it inside the frame which meshes in the large spur wheel. It will be seen that these shears require no foundation to rest upon, that they weigh less than two single pairs of shears, that they are very compact, and, in all respects, desirable for those who use such tools.

The machine was patented through the Scientific American Patent Agency on Feb. 7, 1865, by Julius Hornig, superintendent of the Ontario Iron Works, Oswego, N. Y. Address him at that place for further information.



HORNIG'S SHEARS FOR PLATE IRON.

American Breech-loaders in Switzerland.

The Swiss correspondent of the New York *Staats Zeitung* writes as follows:—

"Your countryman, Mr. H. A. Chapin, Secretary of the New Haven Arms Co., induced by a circular from the Federal Council on the introduction of a breech-loading fire-arm, has exhibited in Berne a number of superior repeating rifles, particularly repeating carbines of Henry's pattern, and thereby he has produced quite an excitement among experts. Since you are acquainted with the effect of this, the best of all fire-arms, particularly from Sherman's great march through Georgia, I will only remark, that Mr. Chapin has a good prospect of introducing his fire-arm among the sharp-shooters of Switzerland."

Coal, Its Use and Abuse.

A series of interesting experiments, "On the use and abuse of coal in our manufactories," has been made by Mr. Lewis Thompson, M.R.C.S., and from the communication to *Newton's London Journal*, he seems to have discovered that practically at this moment in our manufactories, with a kind of coal capable of converting 15 times its weight of water into steam, only 6 lbs. of steam are raised per pound of coal consumed; in other words, more than one-half of the coal burnt under our steam boilers is thrown into the air and lost. This assertion is based upon the daily working of several different steam boilers in London, Manchester, Newcastle-on-Tyne, and Glasgow. Mr. Thompson has come to the general conclusion, that, except immediately after a charge of coal, the air from a well-fed furnace contains no appreciable amount of hydrogen, or hydrocarbon, or sulphurous acid; that the quantity of carbonic acid gas is about 6 per cent, the quantity of oxygen gas about 9 per cent, and the quantity of carbonic oxide gas about 8 per cent—thus leaving us to infer that about 9 per cent of the oxygen in atmospheric air is consumed by the hydrogen of the coal. Hence it appears that, in respect to the production of heat in furnaces, 9 parts of the oxygen of the air escape unacted on; and of the remaining 12 parts, 6 are converted into carbonic acid, 2 combine with the hydrogen to form water, and 4 are carried off in the shape of carbonic oxide gas. Upon these data he states that the heat given out by coal is thus distributed—usefully employed in raising steam, 46⅔ per cent; loss from carbonic oxide gas, 41⅔ per cent, and loss from radiation and imperfect conduction, 11⅔ per cent. We have employed percentages as more generally intelligible than the fractions of a semicircle expressed in degrees, according to which Mr. Thompson calculates. An improved steam-boiler furnace has been invented by Mr. Thompson for preventing the loss.

IRON PLATING OF GRANITE FORTS.

It will be remembered that in 1851, Gen. Joseph G. Totten—then Chief Engineer of the United States Army—made a report to the Secretary of War, giving an account of an elaborate series of experiments undertaken by him to ascertain the suitableness of wrought iron as a lining or facing for the embrasures of granite fortifications. In this report Gen. Totten says:—"Our experiments show that wrought iron is the best material for insertion, as above mentioned, and that a thickness of eight inches of wrought iron, solidly backed with masonry, will resist an 8-inch solid ball, fired with 10¼ pounds of powder, from a distance of 200 yards." General Totten further stated that the plate would offer far greater resistance if rolled in one solid mass, than if made up of eight one-inch plates.

By the report on another page, it will be seen that experiments have been made in England, with heavier shot and charges than those tried by Gen. Totten, and on a facing of iron more than 8 inches in thickness, and the granite casemate was quickly battered to pieces. It is true that the iron facing was not rolled in one solid mass, nor was it backed directly by solid masonry, as recommended by Gen. Totten.

It had altogether 15 inches in thickness of iron, with 6½ inches of teak; the details of its construction will be found in the report. These experiments seem to show that much more than 8 inches of wrought iron will be required to protect granite walls from the force of steel bolts fired from the 10-inch rifled guns at present in use; though what the effect of more solid backing would be can be learned only by further experiments.

DR. ANGUS SMITH, when traveling in a railway carriage, collected some of the particles of dust which floated in the air and which seemed to shine with a metallic luster. On examination Dr. Smith found that the larger class were in reality rolled plates of iron which seemed to have been heavily pressed and torn up from the surface. Another and smaller class were less brilliant, and when looked at with considerable power showed many inequalities of surface. Probably these were the particles which were not torn up but rubbed off.

HUMBOLDT stated that guano is deposited in layers of 50 to 60 feet thick on the granite of many of the South Sea islands of the coast of Peru. During three hundred years the layer of guano deposited is only a few lines in thickness. This shows that many centuries must have elapsed to form the present guano beds.

IT was not until the sixteenth century that the present mode of coating the backs of mirrors with quicksilver and tinfoil was introduced.