R. Brayton.

Making Nuts and Washers.

No. 16,372. Patented Jan. 13, 1857.

Fig. 3.

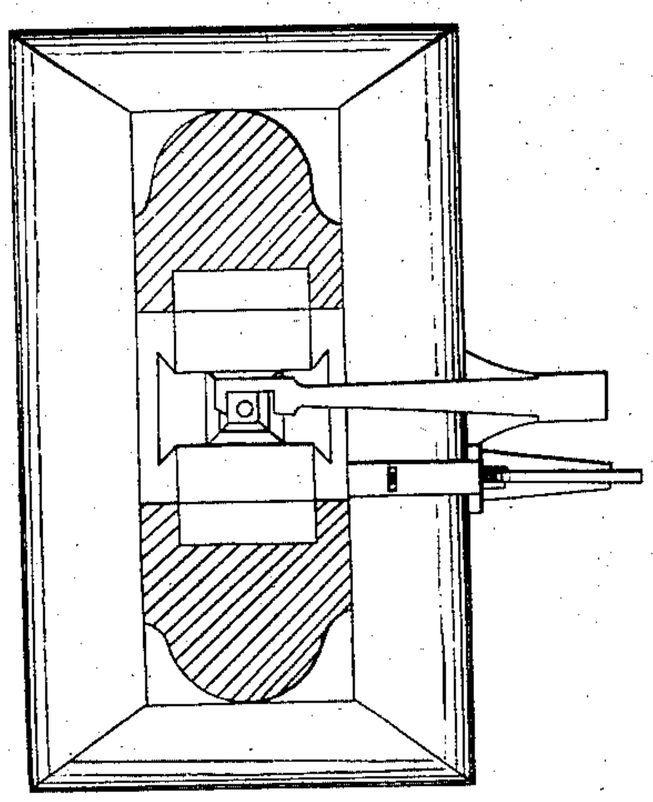


Fig. 4.

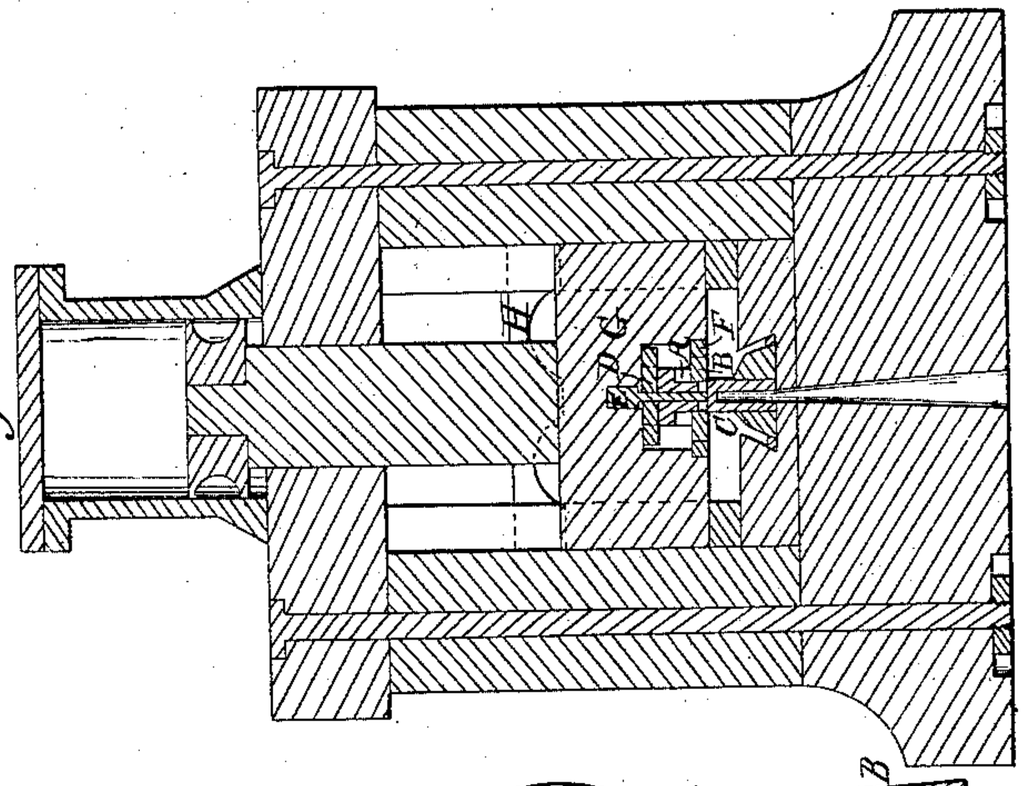


Fig. 2.

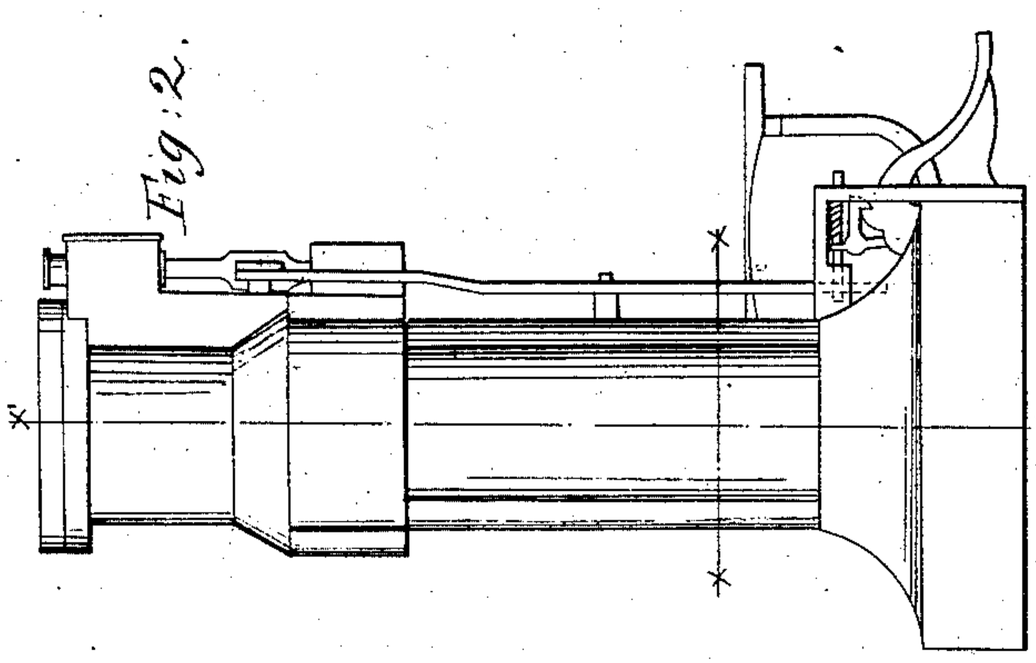


Fig. 1.

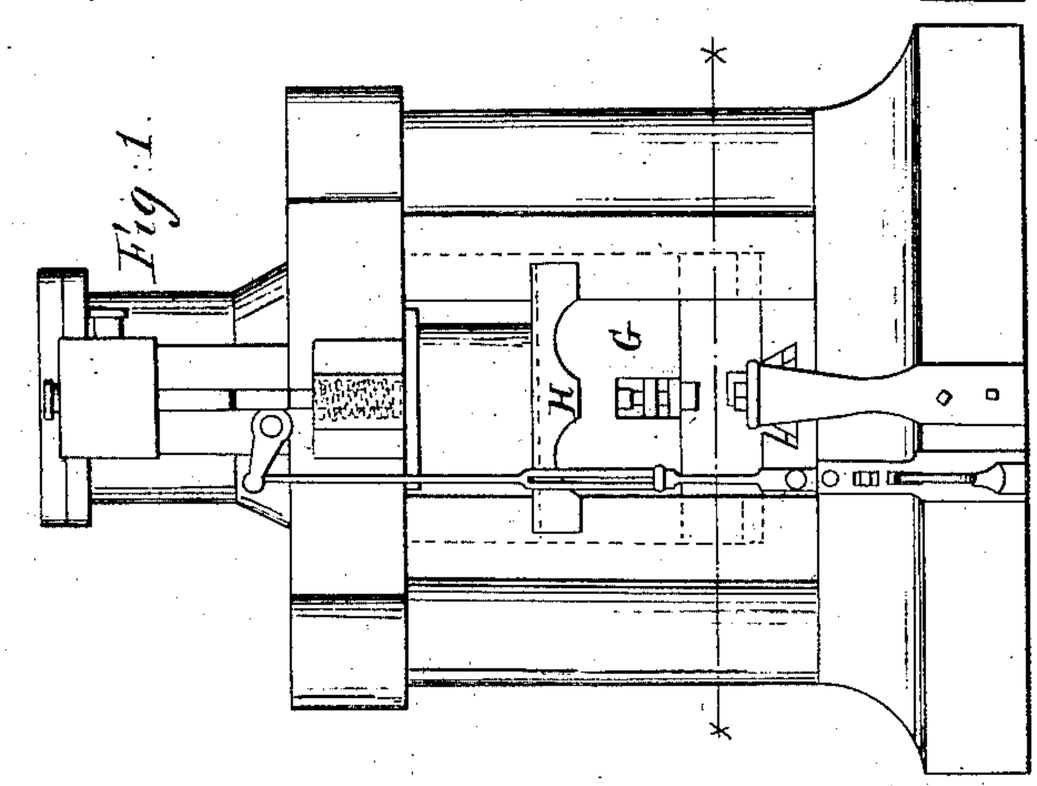


Fig. 11.

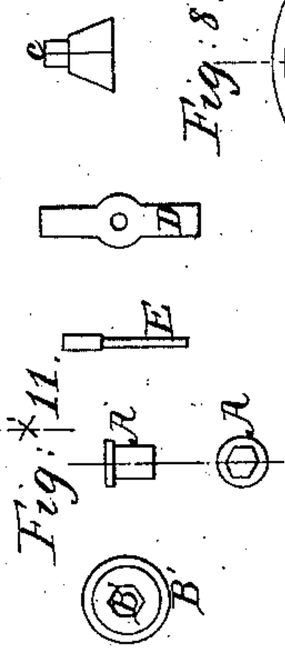


Fig. 8.

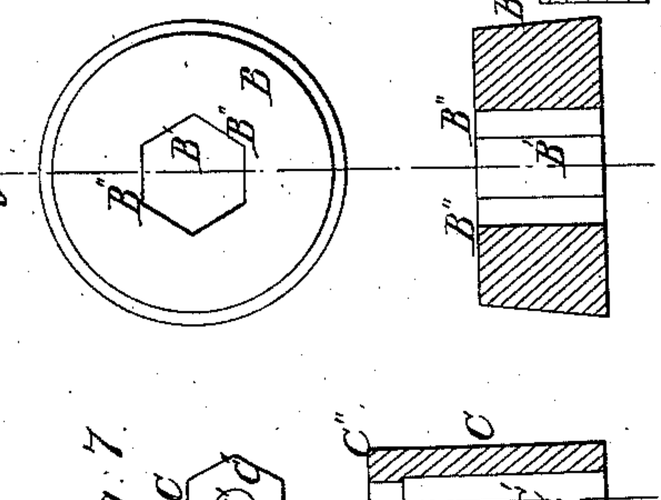


Fig. 7.

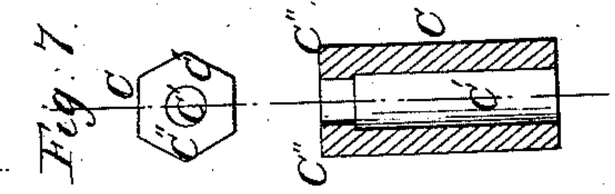


Fig. 6.

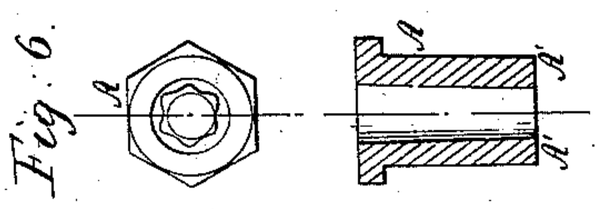


Fig. 9.

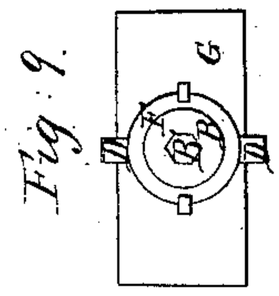


Fig. 5.

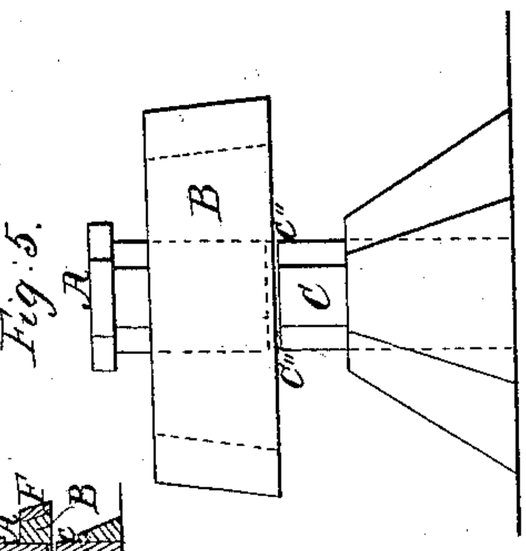
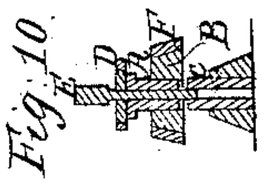


Fig. 10



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UNITED STATES PATENT OFFICE.

ROBERT BRAYTON, OF BUFFALO, NEW YORK.

DIE.

Specification of Letters Patent No. 16,372, dated January 13, 1857.

To all whom it may concern:

Be it known that I, ROBERT BRAYTON, of Buffalo, in the county of Erie and State of New York, have produced a new and useful Improvement, Consisting of Improved Dies for Forging and Swaging Nuts and Washers.

Figure 1 is a front elevation of the nut and washer machine described in Letters Patent granted to me January 9th, 1855. Fig. 2, is a side elevation of the same; Fig. 3, a horizontal section in the direction of the line *x x* in Fig. 2; Fig. 4, a vertical section in the direction of the line *x' x'*, and Figs. 5, 6, 7, and 8, enlarged views of the dies detached from the machine. The other views, Figs. 9, 10, and 11, are also detached sections which will be referred to in description.

Like letters denote like parts in the several views.

My invention or improvement relates to the die or dies used in machines for forging and swaging nuts, washers, etc., and what distinguishes my invention from all others is the manufacturing of the die or dies for such or similar machines of chilled cast iron.

I do not claim to be the inventor of chilled cast iron, as that has been known and used for other purposes.

The machine herein represented is operated by steam, but the same arrangement of dies may be actuated by other suitable means.

The chilled cast iron dies consist of three parts or pieces A, B, C, Figs. 5, 6, 7, and 8. The die, A, works in the die box B, and on the top of the die A, is placed a check plate D, through which and the die A, passes the punch E, as seen in Fig. 10. The die box B, is placed inside the metallic ring F, which ring strengthens it. In this way it is attached to the crosshead G, Figs. 4 and 9. The die box B, and punch E, are so secured to the crosshead, G, that they move simultaneously, while the check plate D, and die A, move independently, to the extent of throwing the nut or other article out of the die box B, as the crosshead ascends, and as the crosshead descends and the nut is being cut off from the heated bar and swaged into shape the die A, and check plate D, raises the thickness of the nut. The lower die C, is so secured in place that it will be in line with the chamber B' of the die box and with the punch E, which enters the die C, perforating the hot blank as seen in Figs. 4 and 10.

In making hot pressed nuts and washers, the heated bar is placed upon the lower die C. Then by the descent of the crosshead the blank is cut off from the bar by the die B, and swaged and compressed into shape in the chamber B' of the die. At the same time the blank is punched by the punch E, and the bur from the nut passing off through the hole C', in the die C, to the ground. As the crosshead returns by the action of steam the check plate D is brought in contact with a check bar on each side of the machine corresponding to H, Fig. 1. This stops the check plate D, and die A, and forces the nut out of the chamber B'. While the blank is being swaged and punched the check plate is forced against the crosshead by the die A, as seen in Fig. 4. Thus the blank is inclosed upon all sides in the chamber B', while being punched and swaged into shape. The sides of this chamber are formed by the die box B, the top by the die A, and the bottom by the die C. In the upper die are grooves to allow the passage of water to cool the punch as may be required, and which may be done during the interval of heating the bar, when the machine is at rest.

The dies may be made in chill boxes, properly arranged, or by any other suitable means, and the dies may be of other forms besides those described, so as to make nuts and washers of more or less number of sides, as may be required. The dies heretofore in use for this purpose have been made of steel, to which there are inevitable objections. The expense of a set of steel dies varies from fifteen to thirty dollars, according to the size and form, while the same set of cast chilled iron dies would cost from one to three dollars. The steel dies will operate well for a short time, but as they are continually exposed to the heat of the hot bar and blank the steel becomes decarbonated and crystallized, and thereby so much changing the quality and nature of the steel, that the dies become either soft or brittle, according to the nature of the steel, and as the dies are constantly being subject to great strain in swaging and punching the hot blank in the die chamber B', the die B will crack in pieces and the cutting edge B'' will become rounded or spalt by the deterioration of the steel. The faces and edges A' and C'', of the dies A, C, are also affected

by the same heat and pressure, but the die B is subject to the most heat and strain as the hot blank is swaged and punched in the die chamber B′.

It is the general practice in using steel dies to cause a jet of water to act on the dies for the purpose of cooling them, which is objectionable, as the water in cooling the dies chills the blanks, which blanks can not be swaged and punched as perfectly as they would be if not chilled. Consequently the nut is strained and hardened, or pinny, which injures the nut and the taps in cutting the thread, which is not the case with chilled dies, as they are not affected in the same degree by heat and pressure.

It is well known that steel when frequently subject to alternations of heating and the action of cold water becomes crystallized. In this state it is unfit for the purpose designed. By the use of steel dies the expense of making hot nuts is rendered much greater, and they are also much less perfect than those made by the use of cast chilled dies, as the steel dies become more or less impaired in the manner herein stated and the nuts correspondingly imperfect, as the heated blank will partake of the form and shape of the dies, as it is being punched and compressed, for the dies forming a mold in which the hot nut is shaped any imperfection in the dies is impressed upon the nut.

The objections and difficulties consequent upon making hot nuts and washers by the use of steel dies are not attendant upon the employment of my improvement, as the new article produced by the chilled cast dies is better, more useful, and can be made cheaper than the old. It is found that the peculiar nature of the chilled cast dies is such that it partakes of all the requisite qualities of the steel dies, without the expense, and its tendency to anneal and otherwise to be impaired by the action of the heat and pressure in manufacturing hot nuts, like the steel dies.

Among the advantages derived from using chilled cast dies instead of steel dies the following may be enumerated: All wrought metal is necessarily fibrous in its structure to a greater or less degree. Its structure therefore can not present a surface that is perfectly homogeneous in its character. The density of wrought steel depends upon the cohesion of its particles by means of welding and condensation under the hammer. The larger the mass of metal, the more imperfect will be the process. Tempering or rendering the surface hard depends upon the sudden cooling of the mass from a red heat, in other words, a sudden crystallization of the carbonate of iron, steel being the carbonate of iron. In thick masses this hardening extends but a little distance below the surface, and the temper is removed by a lower heat than that required to render the mass sufficiently hard for use in the process of tempering. In hardening steel, where large masses are concerned, it is merely case hardening, the metal a little beneath the surface yielding to the blow or pressure, causing the hardened portion to crack and spalt, thus spoiling the dies. The outer surface also soon becomes annealed, and is thereby rendered fibrous. When melted cast iron is suddenly cooled, the molecular arrangement is more compact than when left to cool slowly, and the volume of the mass thus chilled, as compared with steel, is greater in the ratio of the superior degree of heat involved in the respective processes and the perfectness of the conducting medium of the mold or fluid used in the process. The molecular arrangement of cast metal being thus more perfect, the same degree of heat does not anneal it, and repeated blows do not render the surface fibrous, and hence cast dies are more perfect in their structure and more durable than those constructed from wrought metal. The cast chilled die is denser than the steel die and is of more extreme hardness, which renders it eminently well fitted to resist the heat and intense pressure to which it is subject in the manufacture of hot nuts and other similar articles. In hardening the steel dies to render them more durable they are liable to crack by the process, and when thus tempered can not resist the same degree of heat and pressure as the cast chilled iron dies, for the reason before stated. What is needed in making hot punched nuts and washers are dies of such extreme hardness and of such strength as will best resist the heat and pressure to which they are subject, which are found by practical test to be chilled cast dies.

What I claim as my improvement and which I desire to secure by Letters Patent is—

The use of chilled cast iron die or dies, constructed and operating substantially as hereinbefore set forth, for the purpose specified.

ROBERT BRAYTON.

Witnesses:
S. D. BAUSCHAICK,
E. S. HAWLEY.