No. 888,253. PATENTED MAY 19, 1908.

W. G. NICHOLS.

METHOD OF MAKING ARTICLES OF MANGANESE STEEL AND LIKE METAL.

APPLICATION FILED SEPT. 6, 1906.

2 SHEETS—SHEET 1.

Fig. 3

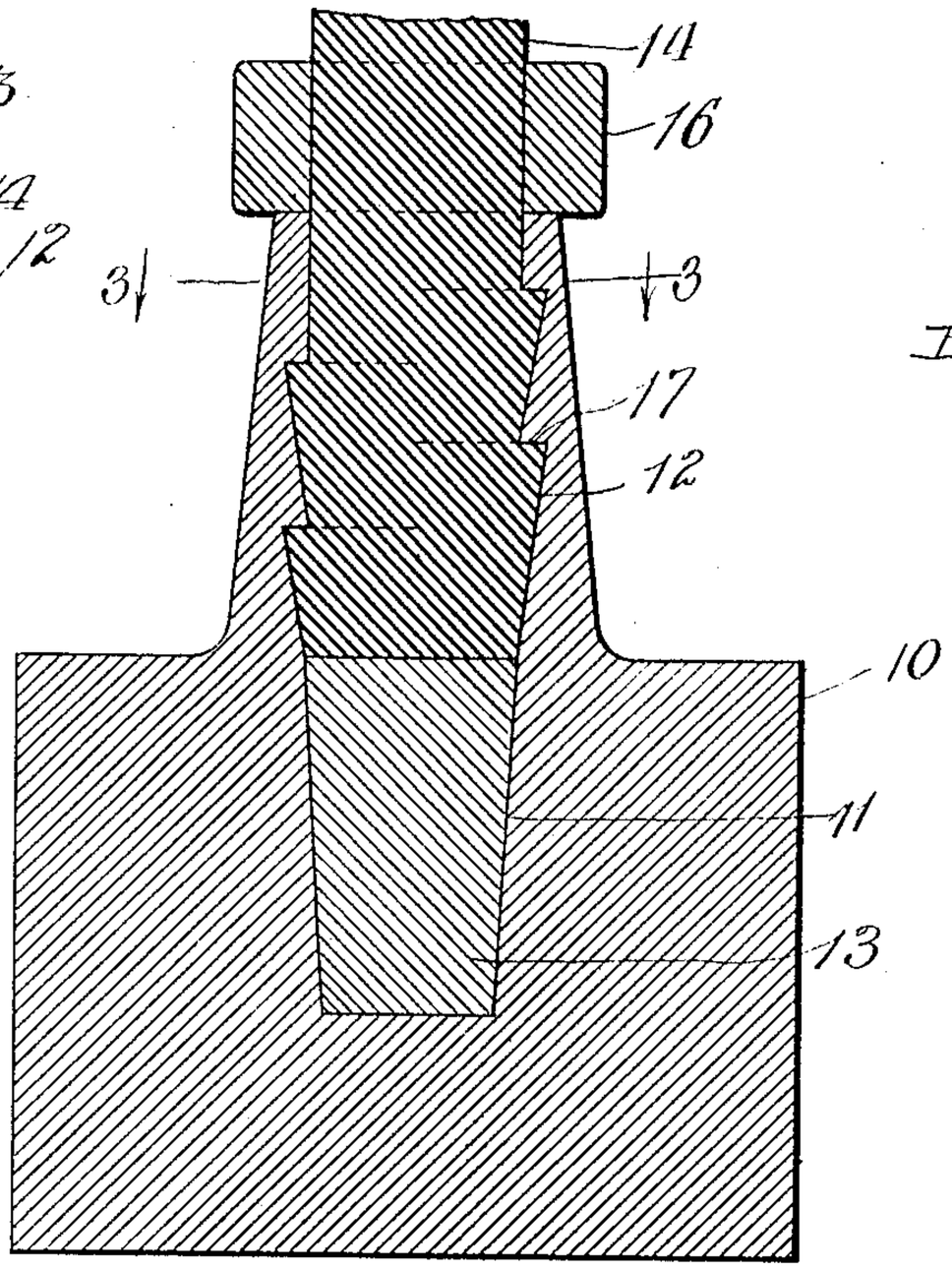
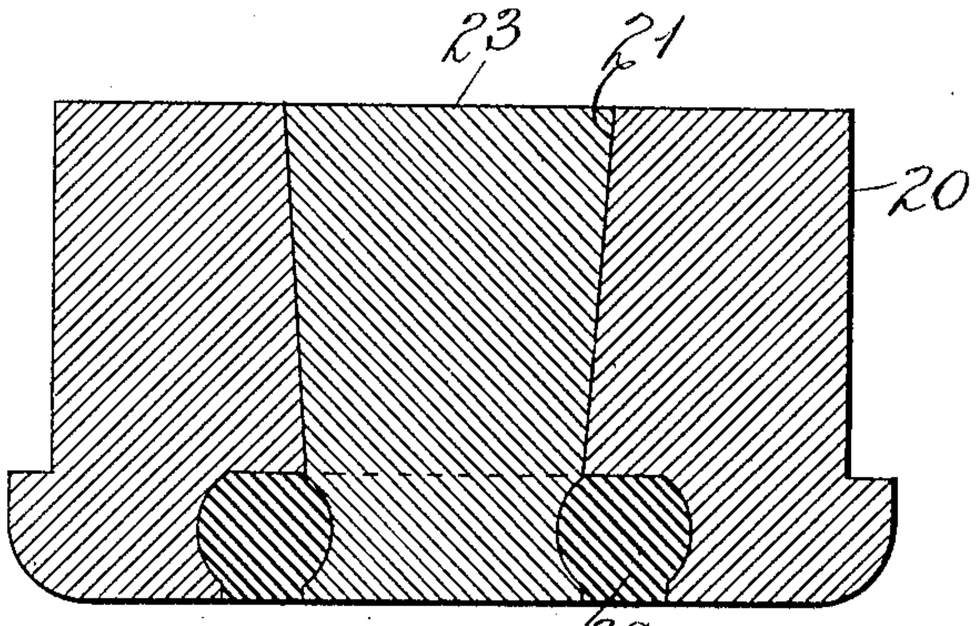


Fig. 1

Fig. 2



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2 SHEETS—SHEET 2.

Fig. 2

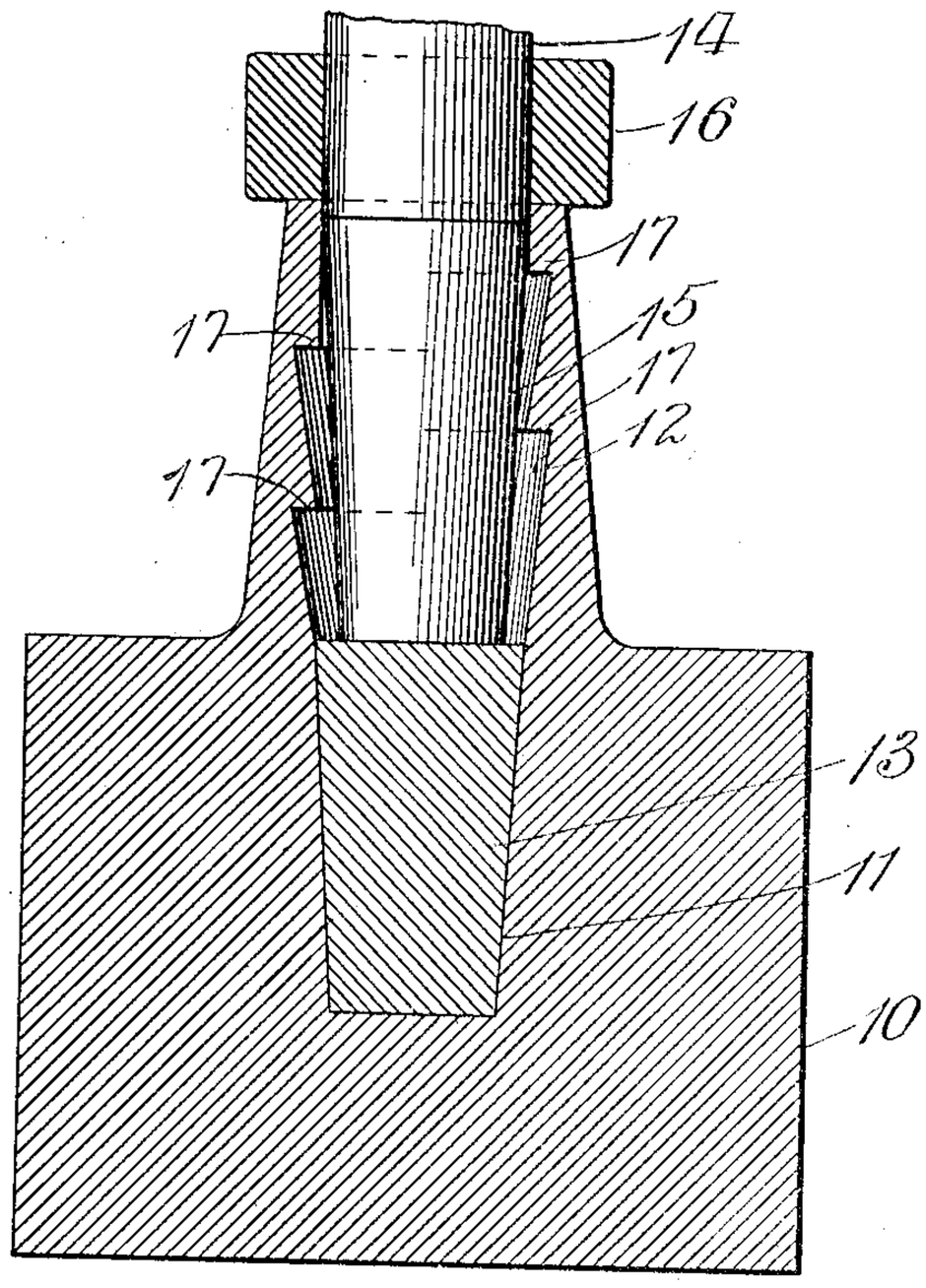
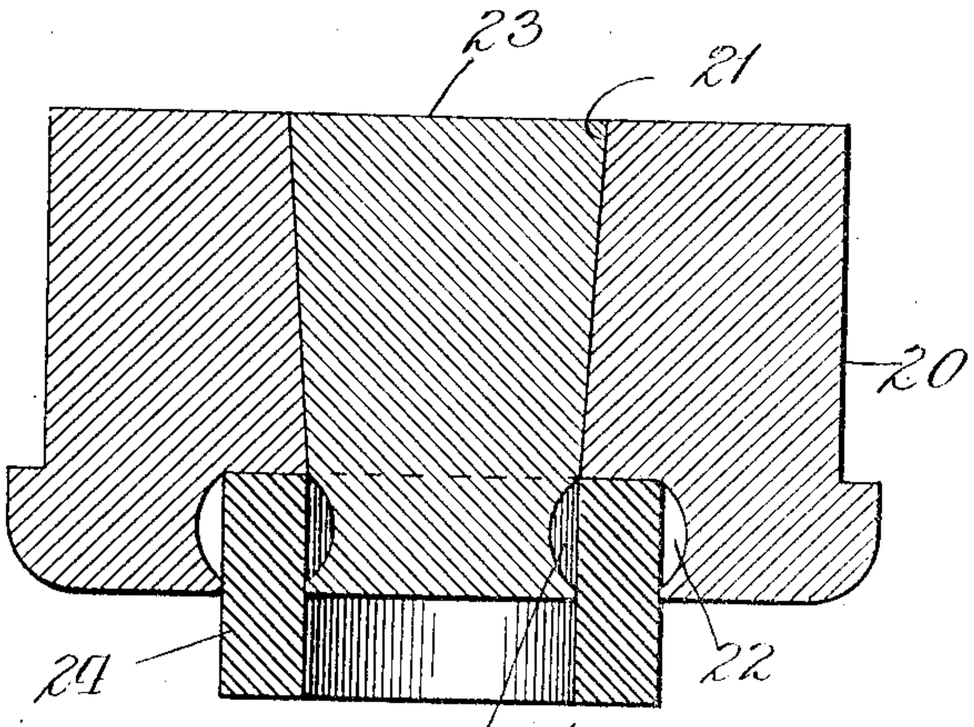


Fig. 5.



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UNITED STATES PATENT OFFICE.

WESLEY G. NICHOLS, OF CHICAGO, ILLINOIS, ASSIGNOR TO AMERICAN BRAKE SHOE & FOUNDRY COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

METHOD OF MAKING ARTICLES OF MANGANESE STEEL AND LIKE METAL.

No. 888,253. Specification of Letters Patent. Patented May 19, 1908.

Application filed September 6, 1906. Serial No. 333,560.

To all whom it may concern:

Be it known that I, WESLEY G. NICHOLS, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in a Method of Making Articles of Manganese Steel and Like Metal, of which the following is a specification.

The object of my invention is to provide a new and improved method of making articles of manganese steel and like material and especially stamp shoes and dies for stamp mills and like machines.

In the drawings: Figure 1 is a central section of an elevation of a complete stamp shoe, made and properly connected to its stem by my new method. Fig. 2 is a similar view of a complete stamp die made by my new method. Fig. 3 is a cross section taken on line 3—3 of Fig. 1. Fig. 4 is a central section of an elevation of a stamp shoe, showing the stem before it has been swaged into the socket provided for it in the shoe. Fig. 5 is a similar view of a stamp die, showing the two members thereof before being united by the swaged ring.

In all of the views the same numerals of reference are used to indicate similar parts.

The material of which such devices should be made must possess the quality of toughness, hardness and durability. With a shoe of this character it is a mechanical problem to secure it firmly to the operating stem by a means sufficiently positive and substantial, for the reason that the metal of which the shoe and die must be composed is of such a refractory nature that it is inexpedient, if not impossible to fashion or change its shape, or configuration, after being cast, by means of ordinary cutting tools. It has been found, from practice, that a metal or alloy, known in the trade as "manganese steel" is admirably adapted for tools of this character.

When first made, castings of manganese steel are extremely brittle and are not, in this condition, adapted for such tools. It, therefore, becomes necessary after making the castings of manganese steel, to subject them to a process of toughening, hardening or tempering, which consists generally in heating the castings to a predetermined degree and subsequently reheating and rapidly cooling them, as by an immersion of the said castings in brine of like solution.

The tempering effect, to render the castings entirely and sufficiently homogeneous, tough and strong for the purpose, should penetrate through the entire casting. Practical experience has demonstrated the fact that this treatment of toughening or tempering, is not effective beyond a depth of four inches from the surface of the casting, and that better results may be attained if every part of the casting is contained within an area which does not at any point extend further than three inches from its peripheral boundary.

I will first describe the finished product, as shown in Figs. 1, 4, and 3, and then will set forth the method of its manufacture.

10 is a stamp shoe, preferably cast of manganese steel, or similar metal, in one piece, and with an opening penetrating the mass beyond its central interior. This opening is composed of two portions, the smooth, tapered depression 11, made into the body part of the shoe, and the irregular tapered opening 12. These openings are formed in the casting, by means of ordinary sand cores, as is common in foundry practice. These openings or depressions, are made into the body part of the shoe so as to present surfaces for the brine or other liquid used in the process of toughening or tempering the castings, to enter the interior of the mass while undergoing the hardening or toughening process, or treatment, whereby every portion of the structure is rendered positively tough and homogeneous. The openings may extend partially through or entirely through the casting, as shown.

A plug 13, tapering to correspond with the opening 11, and preferably made of the same material as that of which the body part of the shoe 10 is composed, and treated and toughened in the same manner, is made to fit the opening snugly and is driven into the said opening by heavy and powerful impact blows until it is firmly seated therein and makes intimate contact with all the surface thereof. The plug is thus placed in the opening in order to provide a solid, continu-

ous mass of strong, tough material, adapted to resist the shock and wear to which the structure is to be subjected.

It is necessary to retain the plug 13 in the position in which it has been seated, and prevent it from jumping out as a result of the vibration produced by the impact or blows delivered by the shoe when in use. To accomplish this result the stem 14 is placed in the opening and subsequently swaged into the irregular surfaces provided in the said opening or socket, for its reception, until the spaces under the ledges are entirely filled with the relatively ductile metal.

Preferably the stem 14 is initially a round bar of forty carbon steel, preferably slightly pointed at the end, as at 15.

The end of the bar is heated to a degree of temperature which renders the end, to some extent, plastic. The immediate end is then dipped into water to harden the end surface. The bar is then inserted in the irregular formed socket 15, while hot, the end being firmly seated on top of the plug 11. The ring 16 is first placed over the end of the bar 14, immediately above the socket, as shown, to prevent the bar from expanding or spreading at the top where it enters the socket 12. After the bar has been inserted in the socket, and while hot it is subjected to the effect of the impact of a series of heavy blows, such as produced by a steam hammer, or to great pressure, as under the influence of a hydraulic press, until the plastic, hot end 15, of the bar 14 has become expanded, or swaged under the ledges 17, thereby securing the manganese steel plug 11 firmly in place within the central mass of the shoe, and securing the shoe to the stem 14, in a manner, and by a method which tends to tighten the union between the shoe and stem as the two are continued in use. Each successive blow struck by the shoe when in regular use tends to increase the binding effect by exerting a tendency to further expand the stem.

By the effective use, the shoe 10 wears away, the working surface gradually approaching the end of the stem, and the shoe is continued in use until subsequently all parts of it have been used up, or worn away.

As a result of the wear described, the lower end of the plug 11 will finally be exposed, but being tapered it will not drop out of the cavity after the line of wear has passed above the lower end of the said plug, but will be retained therein with the same firmness with which it was originally held in place.

The die 20 is also preferably made of manganese steel treated in the manner heretofore referred to with reference to the shoe 10.

The die 20 is provided with a central, tapering opening or perforation 21, provided for the same purpose as that for which the opening 11 is provided in the shoe 10, that is, to present a surface within the central mass so that the tapering effect may penetrate sufficiently from the interior to meet the effect produced by contact of the tempering fluid with the exterior surface, thereby producing a homogeneous, toughened structure. The die 20 has an annular groove 22 cast around the tapered opening 21.

A tapered plug 23, preferably made of the same material as the die 20, and treated in the same manner for the purpose of toughening and hardening, is provided with an annular groove, 23, cast around its lower end.

The opening 21, and the plug 23, are correspondingly tapered toward the lower end, to prevent the plug from being driven through the die, the side surfaces of the die 20 resisting this action.

The plug 23 is driven into the opening 21, by the same method employed for inserting the plug 13 in the opening 11 of the shoe 10, or otherwise forced thereinto, preferably under more or less compression.

An annulus, or ring, 24, preferably of forty carbon steel, is heated to the proper degree of temperature, and placed in the annular groove formed by the depression 23′, in the plug 23, and the groove 22 of the die 20. The ring is then driven, by means of the impact produced by a series of blows from a steam hammer, or otherwise, until the plastic material, composing the said ring, entirely and completely fills the grooves 22, 23′, in a manner plainly shown in Fig. 2. The ring-like cavity is completely filled by the application of impact or pressure, with a high carbon steel mass that will firmly hold the parts of the die in contact, in all conditions of operation.

The die 20 is subject to wear, but as it wears down, the plug 23 is not so affected by the results of wear as to loosen its connection with the main body-part of the die 20.

In the practice of the method heretofore described, my improved shoe and die may be produced and thoroughly tempered, or treated throughout its entire mass to render it sufficiently hard and tough to admirably withstand the effects of the severe use to which it is subjected in actual practice.

I have described my method of construction in connection with stamp shoes and dies, but it is of course obvious that other articles of manufacture may be made by the practice of the same method without departing from the spirit and scope of the claims of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent, of the United States is:

1. The method of producing articles of manganese steel, and like metal, which consists in casting the article with an opening, and casting an insert of manganese steel to fit the opening, then treating said castings to render them tough and durable, then placing

said insert in said opening, and then swaging a softer metal in said opening in position to retain the insert in place.

2. The method of producing articles of manganese steel and like metal, which consists in casting the article with a plurality of openings, between the superficial confines of which not more than eight inches of the solid mass intervenes, casting inserts to fill the openings, then treating said castings and inserts to render them tough and durable, then forcing said inserts in said openings, then swaging a soft metal in said openings to retain the inserts in place.

3. The method hereinbefore described for producing articles of relatively refractory metal, which consists in casting the article with an opening therein and treating said article so formed to render same tough and durable and finally securing an insert of like tough and durable metal in said opening.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

WESLEY G. NICHOLS.

In the presence of—
CHARLES GUEST.
C. G. BAIR.