Jan. 20, 1931. W. H. SMITH 1,789,847

METALLURGICAL FURNACE

Filed July 25, 1927

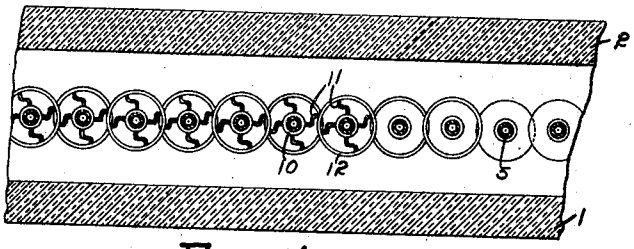


Fig. 1

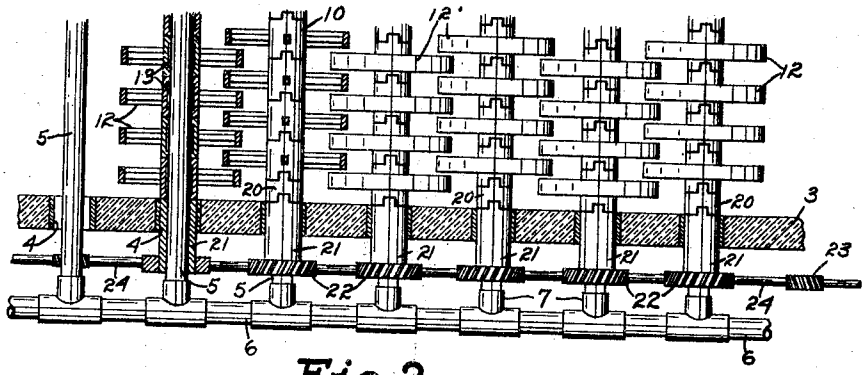


Fig. 2

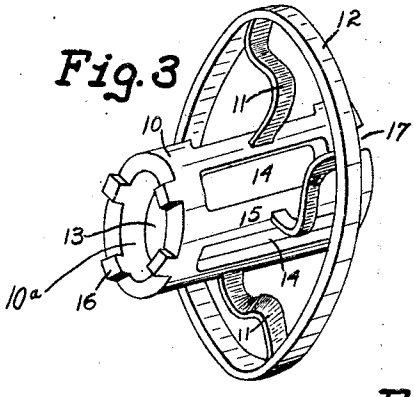


Fig. 3

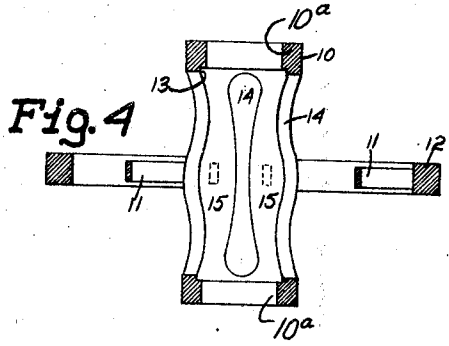


Fig. 4

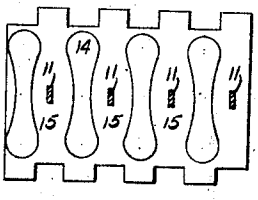


Fig. 5

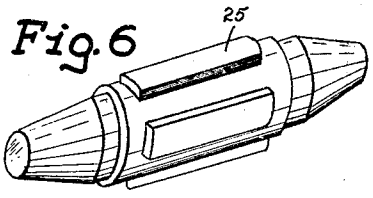


Fig. 6

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UNITED STATES PATENT OFFICE

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METALLURGICAL FURNACE

Application filed July 25, 1927. Serial No. 208,163.

This invention relates to metallurgical furnaces and especially that type of furnace having rolls or disks therein carried by cooled shafts and operable to convey sheets or other articles placed thereon through the heated zone of the furnace. In the type of device to which this invention appertains the different rolls are carried on horizontal hollow shafts, either rotatable or fixed, which are cooled by circulation of fluid therethrough, generally water but sometimes air. Owing to the high temperature to which such furnaces are oftentimes subjected, there are few materials from which such rolls can successfully be made, and even that material is often insufficient in mechanical strength at the operating temperature. Furthermore serious strains are created by the wide differences in temperature between the rim and shaft, since a water cooled shaft is ordinarily maintained at temperature below the boiling point of water. Accordingly it is not sufficient merely to adopt an alloy which will withstand the temperature conditions, but it is also necessary so to design the rolls as to sustain the strain due to unequal thermal expansion and also to transmit the power necessary to operate the same.

In the drawings accompanying and forming a part of this application I have shown a preferred embodiment of my invention. Fig. 1 is a vertical sectional view through a furnace equipped with my improved rolls; Fig. 2 is a horizontal sectional view through a part of said furnace looking downwardly upon said rolls; Fig. 3 is a perspective view of a single roll; Fig. 4 is a horizontal sectional view through a slightly modified form of roll and roll-hub; Fig. 5 is a development of the hub shown in Fig. 4; and Fig. 6 is a perspective view of one of the cores employed in casting the roll shown in Fig. 3.

The base 1, roof 2, and side walls 3 of the furnace may be of any suitable or desired shape, material, or construction except that the latter are provided at spaced points with apertures 4 through which project the horizontal hollow shafts 5 all of which are connected by suitable joints to a feed pipe 6 whereby water, air, or other cooling fluid is fed to the shaft interiors. Preferably these hollow shafts consist of pipes rotatably mounted in suitable swivel bearings 7, although in some cases they may be fixed and the rolls revolved thereon. When the rolls are revoluble on the shafts and the shafts also revoluble in their bearings, the motion will actually occur wherever the friction is least.

Each roll comprises a hub 10, spokes 11, and a rim 12. While it is within my invention to split the hub and rim and bolt them together for use, it is preferable to make the hub and rim each in one piece and integral each with the other. The hub is made of elongated shape, hollowed out to fit the shafts, and preferably has its middle part hollowed out slightly more than the end parts as indicated at 13, each end having a circumferentially continuous bearing portion 10^a. The spokes 11 are integral with this hub, and between adjacent spokes the body of the hub is formed with slots 14 defining the spaced longitudinal webs 15. The ends of the hub are formed with projections 16 and recesses 17, respectively, so that when applied to the shaft, they may be driven one from the other. Each of the spokes is preferably made of pronounced serpentine or S shape so as to facilitate radial expansion and contraction, and, further to this end, each spoke is preferably made comparatively thin in a circumferential direction and wide in an axial direction as illustrated in all the views.

As a result of the shape of the spokes, the dimensions of the spoke, and the slotting of the hub, a sufficient yielding is permitted between the hub and periphery of the disk to accommodate the differences in temperature.

The rolls carried by adjacent shafts are displaced or staggered by interposing spacers 20 at proper points. Sleeved on the projecting end of each of the shafts 5 is a driving hub 21 having teeth and recesses to cooperate with the hub or spacer adjacent thereto, and provided at its outer end with a suitable driving element such as a worm gear 22 adapted to mesh with one of the series of worms 23 carried on the drive shaft 24.

The shape of the slots 14 and the hub is

not specially important. In some cases it is desirable to increase their width towards the end as shown in Figs. 4 and 5, while in other cases it is satisfactory to make them straight from end to end. When the roll is cast in one piece the hub is cored out, the core having suitable lateral projections 25 to form these slots.

Having thus described my invention what I claim is:

1. A roll for metallurgical furnaces comprising a hub having at each end a circumferentially continuous bearing portion and a plurality of longitudinal slots therebetween, said slots defining webs, spokes integral with said webs and a rim carried by said spokes.

2. A roll for metallurgical furnaces comprising rim, spokes, and a hub, said hub formed between adjacent spokes with longitudinal slots each of which extends from a point near one end to a point near the other end of said hub and the end portion of each hub being continuous circumferentially.

3. A roll for metallurgical furnaces comprising rim, spokes, and a hub, the body of said hub having independent radially yieldable portions by which said spokes are carried, and the ends of said hub being formed with projections and recesses adapted to interengage with an adjacent hub.

4. A roll for metallurgical furnaces comprising rim, spokes, and a hub, all of the same being cast in one-piece of a high temperature resisting alloy, said hub being formed with projections and recesses adapted to interengage with an adjacent hub and the spokes being sufficiently curved in the plane of said rim to have one or more portions substantially perpendicular to the roll radius whereby the spokes are rendered radially yieldable.

5. A roll for metallurgical furnaces comprising rim, spokes, and a hub, all cast integral of a high temperature resisting alloy, and the spokes being sufficiently curved in the plane of said rim to have one or more portions thereof substantially perpendicular to the roll radius whereby said spokes are rendered radially yieldable.

6. A roll for metallurgical furnaces comprising rim, spokes and a hub, all cast in one piece of a high temperature resisting alloy, said spokes being comparatively thin in a direction circumferentially of said roll and wide in a direction axially of said roll, each of said spokes being sufficiently curved in the plane of said rim to have one or more portions substantially perpendicular to the roll radius whereby said spokes are rendered radially yieldable.

7. A roll for metallurgical furnaces comprising a rim and a hub of greater axial extension than said rim, said hub having longitudinal slots spaced angularly therearound and each extending from a point near one end to a point near the other end of said hub, and the end portion of each hub being continuous circumferentially.

8. A roll for metallurgical furnaces comprising a rim, and a hub of greater axial extension than said rim, the end portions of said hub being rigid and the intermediate portions thereof being spaced from the supporting shaft and from each other and radially yieldable independently of each other.

In testimony whereof I hereunto affix my signature.

WILLIAM H. SMITH.