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MANUFACTURE OF FOUNDRY MOLDS

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The present invention relates to the manu-
facture of foundry molds and, more especially,
to an improvement in the process described in
the Durand Patents Nos. 1,918,089, 1,918,090 and
1,924,028. As described in the Durand process,
foundry molds are made of a mixture of sand
and cement, with considerably less water than
employed in usual cement-sand mixtures. This
mixture is spoken of in the Durand patent as a
"sub-hydrated" mixture. The water is so reg-
ulated that when the cement-sand mixture is
taken in the hand, it is just coherent enough to
form a highly friable ball. This mixture can
be molded or tamped to form a mold or core of
relatively high porosity and good structural
strength. The Durand process has gone into
rather extensive use and has made a distinct
improvement in foundry practice. Difficulty,
however, has been encountered in some in-
stances, particularly in making castings of man-
ganese steel and other metals poured at very
high temperatures where the casting has re-
entrant angles backed up by a considerable
amount of metal, requiring a projecting part in
the mold. The high heat of the metal and its
access to both sides of the projecting part of
the mold often results in the penetration of the
sand by the metal, forming at the bottom of the
re-entrant angle a porous mass consisting of a
conglomerate of metal and partially fused sand
which is exceedingly resistant to removal by cut-
ting, grinding, or chipping. This action is ap-
parently due to a combination of physical and
chemical factors. The cement-sand mold mix
must be porous to allow the escape of gases
through the mold body. The sand, which is usu-
ally of silica or the like, under the high heat of
the metal tends to fuse with the cement to form
a sort of glass, which does not resist the penetra-
tion of the metal and tends to form the intensely
hard agglomerate of metal and partially fused
mold material. I have found that such disad-
vantages may be entirely overcome by providing
a mold of the Durand type with a thin facing
of substantial thickness composed of alumina
bonded with cement. The alumina is preferably
the fines of the fused alumina employed for
abrasive purposes. This material is sold under
various trade names, such as the well known
trade-marks "Alundum" and "Aloxite". I have
used the fused alumina fines passing a 200 mesh,
with good results, in preferably approximately
the following proportions:

	Parts
Alumina	100
Cement	13
Water	7

While the water content may be somewhat more
than that of the typical Durand mix, it is pref-

erable to use an amount of water substantially
less than that employed in making the usual ce-
ment mixes, so that a mixture is formed which
is moldable but which is not wet enough to slump
and which will have a substantial porosity, al-
though lower than that usually required by the
Durand mixes.

In making a mold according to the present
invention, a moldable mix of the aluminum ox-
ide and cement is tamped against the pattern or
core box to form a facing layer of about 1/2 to
3/4 of an inch thick. This facing layer may be
employed over the entire face of the mold cav-
ity, or may be employed only at the points where
trouble would otherwise be encountered of the
molten metal penetrating into the mold ma-
terial. The term "facing" as used in the claim
is intended to include a facing which may cover
a part or the whole of the mold cavity. The
surface of the facing which is away from the
pattern is preferably left rough or roughened to
provide a good bond with the cement-sand mix-
ture which is next applied. The mold box or
frame is then tamped full of the "sub-hydrated"
mixture of sand and cement described in the
Durand patents. The mold is preferably
strengthened by iron rods embedded in the ce-
ment-sand mold material.

The mold box is taken off the mold, which is
allowed to set as in the regular Durand process,
and which is then ready for use.

The completed mold consists of a porous back-
ing formed of the relatively dry or "sub-hy-
drated" mixture of sand and cement, and a
highly refractory facing, which may be of con-
siderably lower porosity and which is formed in-
tegral with the backing. The cement binder of
the backing and facing unites the two parts
together and there is little, if any, tendency for
the facing to separate from the backing. The
highly refractory character of the surface layer,
and its higher density prevents the penetration
of steel or other highly heated metal into the
mold material. The backing, which is made of
the regular Durand mix, has the high porosity
required for the escape of the gases from the
mold, and also has the structural strength re-
quired.

The highly refractory fused alumina resists
the tendency to form a glass with the cement,
which is encountered with the usual silica sands.
While a limited amount of water is used to retain
some porosity in the facing layer, the fine grain
of the aluminum oxide fines gives a close grained
structure to the facing which resists penetration
of the metal and which gives a smooth surface
to the casting.

While I prefer to use the fused alumina fines
from abrasive manufacture, coarser grained alu-
mina may be used if desired, although it is usually

more expensive and does not give as smooth a surface finish.

While the alumina is preferably the artificially formed fused alumina of the type used in abrasive manufacture, other forms of alumina may be used, for example, corundum, emery, or bauxite preferably calcined. The material should be granular to permit the requisite porosity.

While it is preferred that the facing layer be bonded with and supported by a cement bonded porous backing material like that specifically described in the Durand patents, other backing materials may be used, particularly in the making of cores where low resistance to collapsing is desired. In such case, the ordinary cement-sand mixture may be replaced in part or in whole by green or dry sand, cinders, or the like.

The facing layer consists principally of the alumina and may, if desired, contain minor amounts of other sands, but not sufficient however to materially affect the refractory properties of the mixture.

The material used for a binder is preferably high early strength Portland cement, although ordinary Portland cement or alumina cements may be used.

The term "foundry mold" as used in the claims is intended to include cores as well as molds.

While I have described a preferred embodiment of my invention and have described par-

ticular materials which may be utilized it will be understood that my invention may be practiced or otherwise embodied within the scope of the appended claims.

I claim:

1. A foundry mold comprising a porous facing of substantial thickness composed principally of finely divided fused aluminum oxide bonded with cement, and a backing integrally united with the facing and composed principally of ordinary sand bonded with cement and having a high porosity.

2. A foundry mold comprising a facing of substantial thickness composed principally of granular refractory aluminum oxide bonded with cement, and a porous backing composed principally of sand and cement integrally united with the facing.

3. A foundry mold comprising a facing formed from a moldable but friable mix consisting principally of granular alumina and cement together with an amount of water insufficient to form a dense mixture, and a backing formed from a moldable but friable mixture of sand and cement containing so little water as to form a mass of high porosity.

4. A foundry mold having a facing consisting principally of granular refractory alumina bonded with cement.

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