Our invention relates to a method of and apparatus for producing packing or the like in which a finished core is covered by a sheath, for example strip packing comprising a compressible core and a metal cover, such as described and illustrated in our pending application filed February 21, 1930, Serial No. 430,288, and more particularly to dies for use in hydraulic presses for enclosing a filler such as a strand or the like in a metallic sheath.

Strip packing of the character referred to has heretofore been composed of a compressible core and a sheath comprising either a narrow ribbon or metal foil wound about the core or a relatively broad strip of foil extending longitudinally of the core and bent laterally over the core to form the cover. The edges of the ribbon or strip have sometimes been secured together or bent to form interlocking margins to sealingly enclose the core. All such expedients however, either weaken the packing strip or afford relatively insecure mounting of the cover on the core, leave permeable joints at the connected or free edges of the cover, and therefore do not afford a continuous integral core. The free or connected edges tend to be separated under use, particularly when employed for sealing a movable member in a bearing opening where the packing must be compressed against the movable member.

Distortion of the packing under compression tends to displace the cover from the core and expose the core whereby portions of the relatively thin cover, as well as portions such as strands of the core may be dragged into bearing openings to further dislocate a packing and interfere with the smooth operation of the joint. The walls of covers heretofore provided for compressible cores have been relatively thin due partly to the methods of manufacture.

While efforts have been made to enclose a core in an integral tubular sheath having no free edges the producing processes have usually involved heating the metal covering material for application to the core, whereby changes are produced in the character of the cover material and the core, and when cold-pressed cylindrical sheaths or pipes are produced by hydraulic presses, any filler therefore must be introduced by a step distinct from the pipe-extruding process.

In view of the conditions above set forth and others, our invention has for its principal objects to enclose a core in an integral tubular metal sheath, to form a packing strip having a compressible core and a metal cover having no joints, to effect the formation of a covered packing by means avoiding the application of heat to either cover or core during the forming process, to reduce the labor and cost involved in producing filled metallic sheaths, to permit use of any desired metal composition in a sheath, to provide a strand including a cover having any desired conformation and thickness, and to provide a hydraulic press die adapted for coincidental delivery of a tubular sheath and a filler enclosed in the sheath.

In accomplishing these and other objects of our invention, we have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view partly in section of a hydraulic press and a die constructed in accordance with our invention, illustrating the delivery of cylindrical packing strands therefrom.

Fig. 2 is a vertical central section of the die through channels and recesses for packing core and coating material.

Fig. 3 is a section on the line 3—3, Fig. 2.

Fig. 4 is a section on the line 4—4, Fig. 3.

Fig. 5 is a detail perspective view of die portions shown separated.

Referring in detail to the drawings:

1 designates a hydraulic press comprising a base 2 provided with a vertical plunger chamber 3 communicating through an inlet port 4 with a supply line 5 for delivering liquid under pressure to the chamber, and a head 6 having a lateral arm 7 provided with an opening 8 concentric with the chamber.

A ram or plunger 9 having a through bore 10 and a ring flange 11 removably secured to the head by bolts 12 projects downwardly toward the chamber on the axis of the open-
ing 8 and has an inwardly tapered lower end edge 13 forming a beveled conical guide and a circular recess 14 at the inner end of the beveled guide to receive a die 15 which will later be described in detail.

The lower end of the fixed plunger 9 is spaced vertically from the upper end of the chamber 3, and a cylinder or plunger 16 having a bottom wall 17 to form a metal-containing chamber is located in the chamber 3, and adapted to move slidably over the fixed plunger, whereby operation of the press will elevate the sliding plunger and press metal 18 therein into the fixed plunger and through the die.

The die comprises a die block 19 consisting of a cylindrical body adapted to be drive fitted into the recess 14 and having a downwardly-projected annular recess 20 forming a depending axial boss 22, and a skirt-like outer wall 23, an annular series of vertical channels 24 arranged adjacent the axis of the block and extending through the boss, and apertures 25 of any desired cross section forming an annular series of ports located preferably on the median line of the annular recess.

The die block is further provided with radial notches 26 formed in the edge of the skirt-like wall 23 to receive the outer ends of arms 27 of a spider-like intermediate member including a cylindrical body 28 having the same diameter as the boss 22 and adapted to abut the lower face thereof.

Formed on the upper faces of the arms 27 and extending upwardly in the recess 20 to points adjacent the bottom thereof are cores or bosses 29 having upwardly converging walls and axial channels 30 aligned with the ports 25 in the die block, the upper ends of the bosses being spaced slightly below the lower ends of the ports. Longitudinal grooves 31 are provided in the lower faces of the arms and a spider-like base member 32 includes arms 33 having tongues 34 seated in the grooves 31 and longitudinal sharpened lower edges 35, the die being assembled by pressing the upper spider into the block and the lower spider into the intermediate spider, whereby metal pressed upwardly into the recess around the arms of the spiders will be extruded through the ports in strips having cross section corresponding to the contour of the ports.

The vertical channels in the die block communicate through lateral conduits comprising mating grooves 36 and 37 in the lower faces of the arms 27 and the upper faces of the arms 33 respectively, with the axial channels in the bosses, whereby cord-like wicks or cores 38 supported by reeds 39 on the press head and running on pulleys 40 may be passed downwardly through the bore in the fixed plunger and the die block channels and conduits into the bosses and upwardly there-through to locate the cores on the axes of the extruded tubular bodies of metal, and thus effect delivery of metal and core coincidently and enclose the core in the tubular metal body.

The extruded products comprising the metal sheaths and enclosed cores will be integral units and have substantial tensile strength whereby they may be led upwardly through the hollow fixed plunger to a sheave 41 mounted on the press head, thus being delivered as continuous strips into a suitable container 42 wherein they may be cooled for storage and delivery.

The apparatus has been illustrated and described as including a conical boss and cylindrical ports 24, adapted to form a cylindrical sheath enclosing a compressible core and comprising a packing strip especially adapted for application to a movable rod in a stuffing box. It is apparent that the forms of the ports 25 may be adapted for the production of a strip having a desired form, tubular or otherwise, and the die channels and channeled bosses may be adapted for delivery of any desired filling material to suitable points adjacent the ports into the hollow bodies of the sheaths in process of formation for enclosure in and incorporation with the sheaths.

In using apparatus constructed as described and carrying out our method of manufacture for the usage illustrated, a supply of filler cords is provided on reels on the press head and led to and through the die to feed said filler up through the cores or bosses 29 for exit with the desired sheath of metal, via apertures 25.

The sliding cylinder when in retracted position leaves space between the fixed ram and upper end of the chamber 3, and a mass of metal of suitable character is provided in the chamber, and may comprise any desired alloy adapted to perform a particular service when manufactured into strips. The press preferably operates upon the metal while the latter is cold and therefore no chemical change in the character of the metal is effected at any stage in the operation of the apparatus, whereas thinning of the metal by heat or other means would tend to alter the character of an alloy.

The pressure fluid is then applied to elevate the sliding cylinder. The press is adapted to withstand heavy strain, and high pressures are applied for extruding the metal, the beveled end of the fixed ram guiding the pressed metal upwardly over the cutting edges of the die into the annular recess and causing it to flow over the upper faces of the arms 27 and cover the entire outer surfaces of the conical bosses. As the upwardly moved metal passes the upper end of a boss, a wall is formed surrounding the core protruding upwardly from the axial opening in the related boss and through the port of the
die block, the metal thus engaging the core. The metal pressed through the port drags the core which thus forms and fills the bore of the tubular strip formed by the extruded metal.

When the supply of metal in the cylinder has been exhausted, the liquid employed for applying hydraulic pressure may be drained, the sliding cylinder retracted into the chamber, to space the upper end of the sliding cylinder from the lower end of the fixed ram and a new supply of metal introduced into the sliding cylinder.

It is apparent that dies may be provided adapted to form strips of different shapes. Dies having relatively large channels and grooves adapted to deliver cores of relatively large diameter, and having bosses and ports shaped to produce strips having any desired cross section may be substituted in the fixed ram, and other fixed rams provided with dies of the desired particular detail formation may be substituted for the removable fixed ram illustrated.

It is apparent therefore that we have provided a novel method for forming a packing strip including a compressible core and an integral cover entirely surrounding the core and having no free edges or mechanically connected seams, for producing a continuous sheath enclosing a filler, and for enclosing a filler in a sheath during production of the sheath, and that continuous strips of packing may be produced rapidly with relatively small expense whereby efficient packing may be available at low cost.

The filler may consist of any desired material for a particular purpose, and suitable means will be provided to lead the material to the cores of the die, and delivering the filler to the die and sheath, the filler illustrated being preferably cord-like strands of material such as flax having sufficient tensile strength to be extended from reeds through the fixed ram and the die channels, and to be pulled through the channels by the extruded metal without breaking.

The cover material may consist of any desired substance capable of being extruded through the die, and preferably adapted to be extruded cold, the material preferably employed for forming a sheath of a packing strip being lead or an alloy of lead.

What we claim and desire to secure by Letters Patent is:

1. A die for the purpose described, including a perforate die block having an annular recess, and means, including a spider having a boss located in said recess and provided with a channel registering with one of the perforations in said block, for delivering a filler to a sheath comprising metal extruded through the recess and perforation.

2. A die including a die block having a filler inlet channel, a sheath outlet port and a recess communicating with said port, a spider fixed in the die block across said recess and including a core member having a channel registering with said port and provided with a conduit connecting said channels to guide a filler adapted to be delivered to the interior of a sheath of material pressed through the spider and recess over the core member and through said port.

3. A die including a die block having an annular recess in one face, a filler inlet channel, and a sheath outlet port communicating with said recess, a spider having arms spanning said recess and a boss located in the recess provided with a channel registering with said port and spaced therefrom to allow material passing through the spider and recess over the boss to pass through said port to form a sheath, and means connecting said channels for introducing a filler into the sheath.

4. In apparatus of the character described, a die including a die block having an annular recess, and outlet ports for metal pressed into the recess, and a base having bosses located in said recess, said block and base having cooperating channels including portions extending on the axis of said bosses and in alignment with said ports to conduct material to said ports, and means for pressing the metal through said recess for extrusion through said ports to surround said material with said metal.

5. In apparatus of the character described including a plunger chamber member in fixed position, a tubular ram mounted in fixed position on the extended axis of the chamber member and provided with a die, and a hollow plunger slideable in the plunger chamber and over the ram.

6. In apparatus of the character described, a press having an upwardly presented plunger chamber and a tubular depending fixed plunger having a bevelled lower edge, a plunger having a closed bottom slideable in the plunger chamber and over the fixed plunger, and a die mounted at the lower end of the fixed plunger having channels for sheath material and also having apertures for filler material passed to and from the die through the fixed plunger.

In testimony whereof we affix our signatures.

CHARLES F. FIELD.
ZENO E. FLICK.