Dec. 13, 1932. E. A. PETERSON 1,890,622

JORDAN ENGINE

Filed Aug. 26, 1929 2 Sheets-Sheet 1

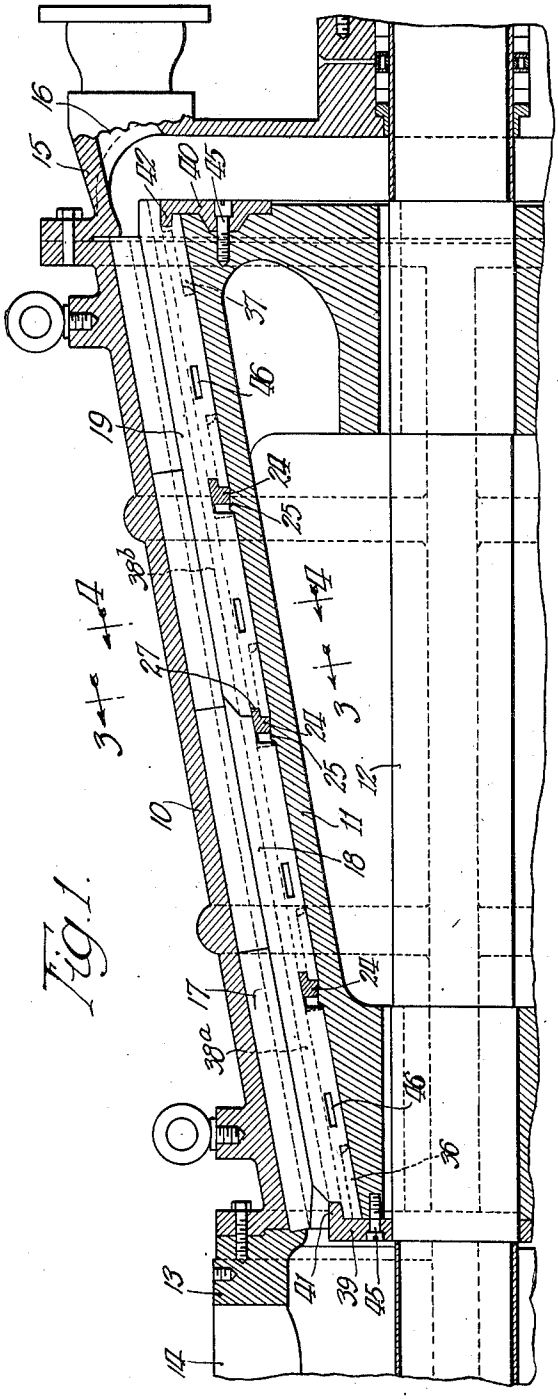


Fig. 1.

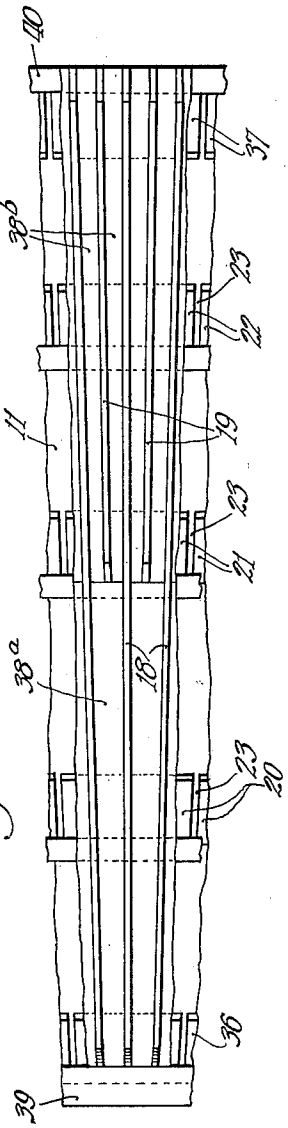


Fig. 2.

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Fig. 3.

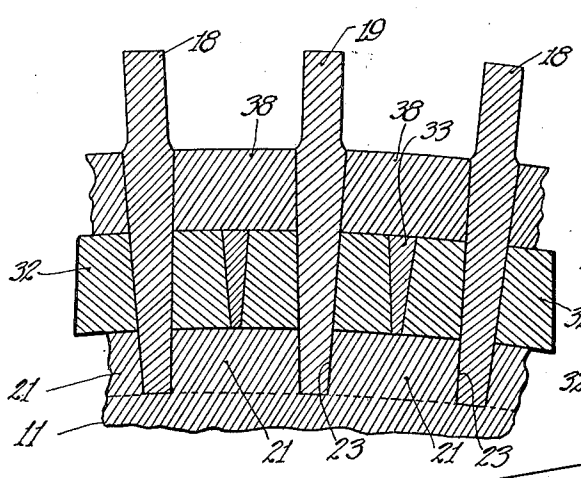


Fig. 4.

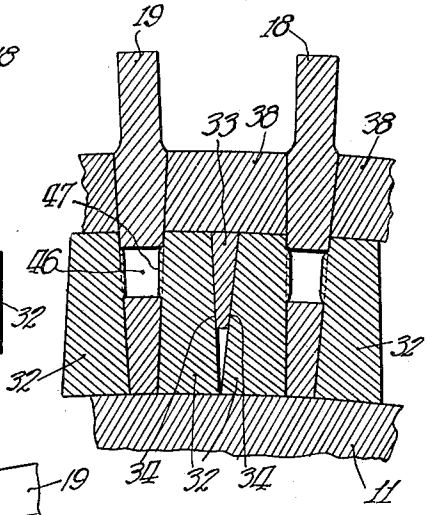


Fig. 5.

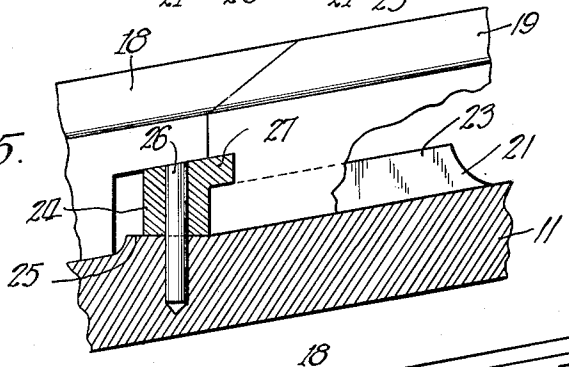


Fig. 6.

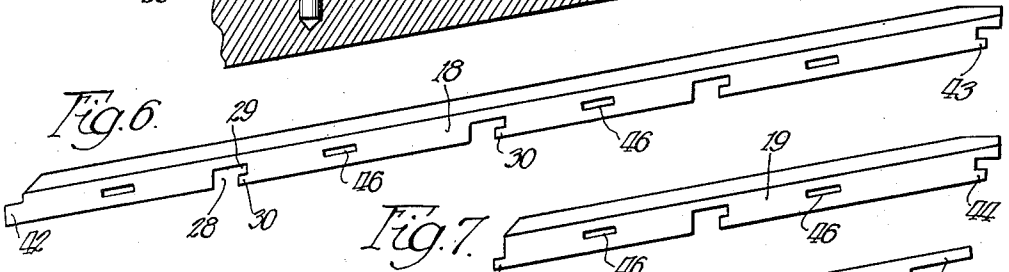


Fig. 7.

Fig. 8.

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UNITED STATES PATENT OFFICE

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JORDAN ENGINE

Application filed August 26, 1929. Serial No. 388,352.

This invention relates to Jordan engines and has particular reference to improved means for mounting the knives of the plug of such an engine.

The objects of the invention are to provide means for facilitating mounting, removal or replacement of the knives on a Jordan plug; to provide means which will effectively maintain the knives in proper operative position, while at the same time being such that the mounting or replacement of knives on the plug may be accomplished with considerably less labor and in considerably less time than has heretofore been required; to provide means for mounting the knives which will permit the provision of deeper spaces between the knives than has heretofore been practicable; and, in general, it is the object of my invention to provide an improved Jordan plug.

Other objects and advantages of the invention will be understood by reference to the following specification and accompanying two sheets of drawings, in which I have illustrated a part of a Jordan engine equipped with a plug embodying a selected form of my invention.

In the drawings:

Figure 1 is a fragmentary longitudinal sectional view of a part of a Jordan engine including a part of the plug.

Figure 2 is a side elevation of a part of my improved plug structure.

Figures 3 and 4 are fragmentary sections of the plug on the lines 3—3 and 4—4, respectively, of Figure 1.

Figure 5 is an illustration of a part of the structure shown in Figure 1, but on an enlarged scale, and showing the structure in greater detail.

Figures 6 and 7 are side elevations of the long and short knives which are mounted on the plug.

Figure 8 is a side elevation of a device which is used for supporting the knives in operative position.

Referring now to the drawings, I have indicated the outer shell of a Jordan engine at 10 and the plug which fits inside of the shell at 11. The plug 11 is carried by an axle or shaft 12 which is journaled in suitable bearings which are provided in any approved manner, the plug body 11 and shaft 12 being splined or otherwise locked together so that the plug body 11 may be rotated within the shell through the agency of the shaft 12. A head member 13 is bolted to the small end of the shell 10, and is provided with an inlet opening 14 and a head member 15 is bolted to the large end of the shell 10 and is provided with an outlet 16.

Knives such as indicated at 17 are mounted in the shell 10 in any approved manner, it being understood that there is a plurality of knives 17 projecting inwardly from the shell in circumferentially spaced relation. The plug body 11 is also provided with knives such as indicated at 18 and 19, the plug knives 18 and 19 cooperating with the knives 17 of the shell when the plug is rotated to reduce paper stock passed through the engine to a suitable degree of fineness.

As above indicated, my present invention has particular reference to improved means for mounting the knives 18 and 19 on the plug body 11. My improved mounting means includes the provision of a plurality (three in the present instance) of annular boss-like formations 20, 21 and 22 on the surface of the plug intermediate its ends. As shown, the annular bosses are spaced longitudinally of the plug, and these bosses are provided with recesses or slots such as shown at 23, which extend crosswise of the bosses (longitudinally of the plug), the slots being cut deep enough so that the bottoms thereof are in effect continuations of the surface of the plug body. It will of course be understood that the annular bosses are provided with a

plurality of recesses or slots 23 spaced circumferentially around the slot, the slots being adapted to receive and position the knives 18 and 19 in their proper operative relationship. In accordance with well known practice, the larger end of the plug, which is of frusto-conical shape, is provided with a plurality of short knives 19, which are located intermediate the full length knives 18. Accordingly, the bosses 21 and 22 are provided with slots to receive the short knives in addition to the slots for receiving the long knives.

For anchoring the knives on the plug against radial outward displacement, I provide means for interlocking the knives and plug body, this means including annular members such as 24, which are seated on shouldered portions 25 of the plug, the shoulders beng conveniently formed as a part of the bosses 20, 21 and 22 which are cut away to provide the seats as desired. The annular members 24 are permanently mounted on the plug by being shrunk and pinned on the shouldered portions 25 by means of pins, as shown at 26, so that the annular member cannot be rotated relative to the plug. The annular members 24 are provided with laterally projecting flange portions 27 which extend over the adjacent ends of the grooves 23, as clearly shown in Figures 1 and 5. The knives 18 and 19 are provided with hook-like formations in their lower edges by recessing the knives as shown at 28, these recesses being undercut as shown at 29, so as to form the projecting portions 30 which are adapted to fit under the projecting flange portions 27 of the annular members 24. The recesses 28 are of sufficient width to permit the knives to be slipped over the annular members 24, and thereafter moved endwise to cause the projecting portions 30 and 27 to interlock.

The inner ends of the short knives 19 are provided with outwardly, endwise projecting portions 31, which are adapted to fit under the projecting portion 27 of the middle annular member 24, so that the inner ends of these short knives are effectively locked against radial outward displacement.

For supporting or maintaining the knives 18 and 19 in operative position, that is to say, in the desired circumferentially spaced relation, filler elements are provided which fit between said knives. These filler elements are divided into upper and lower portions, the lower portion being formed of a pair of wedge strips 32, 32 and a wedge 33. The wedge strips 32, 32 are preferably made of suitable wood and are provided with adjacent inclined faces 34, between which the wedge 33 is adapted to be driven so as to spread the strips 32 into engagement with the adjacent faces of the knives. As shown in Figures 3 and 4, the knives are of such cross section that the spaces therebetween are wider adjacent the bottoms of the knives than at the top thereof, reference being had to the portions of the adjacent faces with which the wedging devices and filler elements co-operate. The wedge strips 32 obviously may be inserted from the outside of the plug, i. e., by movement of the wedge strips in a direction transverse to the length of the knives. When the wedge strips 32, 32, are positioned as desired, the wedge 33 may be driven in from the outside of the plug, thereby to separate the said wedge strips so as to form a tight-fitting 3-piece filler element which serves to effectively hold the knives in operative position. The wedge strips 32 and wedges 33 are in lengths which fit between the adjacent annular members 24 and between the annular members 24 and the adjacent ends of the plug. Accordingly the wedge strips are provided with recessed end portions as indicated at 35, the narrowed end portions fitting over the respective annular bosses 20, 21 and 22. As clearly shown in Figure 1, the plug body 11 is also provided with annular bosses 36 and 37 at its opposite ends, these bosses being also slotted to receive the knives in the manner in which the bosses 20, 21 and 22 are slotted.

For locking the wedging devices 32, 32 and 33 in operative position, I provide locking strips 38 which fit in the spaces between the knives outside of the said wedging devices. The locking strips 38 are slightly wedge-shaped in cross section so that the width of the strip at its bottom face is wider than its width at its top face, whereby the strip must be inserted between the knives by being moved endwise from one end of the plug. Obviously, the wedge strips 38 when inserted in this manner cannot come out in a radial direction from the plug, because of the increased bottom width of the same as compared with the reduced width of the space at the upper or outer end thereof. Because of the arrangement of long and short knives, as clearly shown in Figure 2, the locking strips are divided transversely into inlet end strips 38^a and outlet end strips 38^b, the latter being considerably narrower than the strips 38^a so as to fit in the narrower spaces between the alternately arranged short and long knives. The knives 18 and their inlet end wedging devices and locking strips are first mounted on the plug, after which the knives 19 and their wedging devices and locking strips are assembled.

For holding the knives in place at their outer ends, I provide end members 39 and 40 which are removably mounted on the inlet and outlet ends, respectively, of the plug, the end member 39 is provided with an inwardly projecting, annular flange 41 which is adapted to fit over projecting end portions 42 of the long knives 18, and the end member 40 is provided with an annular flange part 42 projecting inwardly of the plug and adapted

to fit over end projections 43 and 44 of the long and short knives, respectively. The end member 39 is preferably arranged so that it acts as a stop for the locking strips, thereby facilitating assembling thereof.

The end members 39 and 40 may be removably mounted on the plug in any suitable manner, one means being by cap screws such as shown at 45, and suitable means may be provided for facilitating removal of these end members when desired. One such means may be to provide tapped openings through the respective end members which are normally closed by means of a plug fitting such tapped openings. The plugs may be removed and replaced by cap screws or the like which fit the tapped openings, whereby, when the screws are turned in, into engagement with the ends of the plug body, the respective end members 39 and 40 will be jacked out of place.

The wedge strips 32, 32 are preferably of wood, such as oak or other suitable kind, which when wet swells and accordingly tends to exert an increased holding pressure on the knives. In order to more securely hold the knives in place against radial displacement, I provide the knives with one or more openings 46, into which the wedge strips 32 may swell, as indicated at 47, to thereby form, in effect, an interlocking connection between the wedge strips and knives.

I am aware that changes may be made in the above-described structure without departing from the spirit of my invention, the scope of which should be determined by reference to the following claims, construing the same as broadly as possible consistent with the state of the art.

I claim as my invention:

1. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on said body in circumferentially spaced relation, means for maintaining said knives in said spaced relation comprising wedging devices insertable between adjacent knives in a radial direction relative to the plug from the outside thereof, and independent wedging means fitting between said knives outside of said wedging devices for locking the respective wedging devices in operative position.

2. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on the surface of said body in circumferentially spaced relation, said knives being so shaped in cross section as to provide spaces between adjacent knives which are wider at their bottoms than at their tops, means for supporting said knives in said spaced relation comprising wedging devices insertable between the adjacent knives in a radial direction relative to the plug from the outside thereof, and means for locking said wedging devices in operative position comprising locking bars having greater inside width than outside width and fitting snugly in the space between adjacent knives outside of said wedging devices and insertable into operative position by endwise movement between the knives.

3. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on the surface of said body in circumferentially spaced relation, said knives extending longitudinally of the plug, means for supporting the knives in said spaced relation comprising wedging devices insertable between adjacent knives in a radial direction relative to the plug and knives from the outside of the plug, said wedging devices comprising a pair of wedge strips fitting between adjacent knives and a wedge adapted to be driven between the strips from the outside of the plug to wedge the same into engagement with said knives, and means for locking said wedge in operative position.

4. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives adapted to be mounted on the surface of said body in circumferentially spaced relation, said knives extending longitudinally of the plug and being so shaped in cross section that the spaces between the knives are wider at their bottoms than at their tops, means for supporting said knives in said spaced relation comprising wedging devices insertable between adjacent knives in a radial direction relative to the plug from the outside thereof, said wedging devices comprising a pair of wedge strips fitting between adjacent knives and a wedge adapted to be driven between the strips to wedge the same into engagement with said knives, and means for locking said wedge strips into operative position, comprising locking strips fitting between adjacent knives outside of said wedging devices, said locking strip being shaped in cross section to correspond to the cross-sectional shape of the space occupied thereby and being adapted to be driven into place.

5. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on the surface of said body in circumferentially spaced relation, said knives extending longitudinally of the plug, means for interlocking said knives and plug body so as to prevent radially outward displacement of the knives from the plug, said interlocking means being adapted to be engaged or disengaged by relative endwise movement between said parts, means in the spaces between adjacent knives for supporting the same in spaced relation, said means comprising inner wedging devices adapted to be inserted in the spaces between said knives from the outside of the plug and in a radial direction relative to the plug, and outer locking strips adapted to be inserted into said space

over said wedging devices, said locking strips being insertable by endwise movement from one end of the plug.

6. In a plug for a Jordan engine, the combination of a plug body, an annular boss on the surface of said body intermediate its ends, said boss being provided with a plurality of circumferentially spaced slots extending longitudinally of the plug, the bottoms of said slots being substantially coincident with the surface of the plug body, an annular member permanently mounted on said plug body, associated with said boss and provided with a flange extending laterally over portions of said slots, a plurality of knives respectively seated in said slots and provided with recessed portions adapted to interlock with said laterally projecting flange so as to anchor the knives against radial outward displacement from the plug body, and means fitting in the spaces between said knives for maintaining the same in operative position.

7. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on said body in circumferentially spaced relation, wedging devices extending longitudinally of said knives and fitting in the spaces therebetween for maintaining the same in operative position, said wedging devices being insertable from the outside of the plug body in a radial direction relative to said plug body and knives, said knives being so shaped in cross section as to provide spaces therebetween outside of said wedging devices which are wider at their bottoms than at their tops, and means fitting in said spaces for preventing radial outward displacement of said wedging devices.

8. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives extending longitudinally of said plug body and mounted thereon in circumferentially spaced relation, an annular, outwardly projecting member on said plug body intermediate its ends having interlocking engagement with said knives for preventing radial outward displacement thereof, end members removably mounted on said plug body and having interlocking engagement with the adjacent ends of said knives for preventing radial outward displacement of the knives at their ends, independent means on opposite sides of said annular member, in the spaces between said knives and between said annular member and end members for supporting said knives in operative position, said means being insertable from the outside of the plug in a radial direction relative to the plug body and knives, and means for locking said wedging devices in operative position, comprising locking strips disposed in the spaces between said knives, outside of said wedging devices, said knives and locking strips being arranged so that the locking strips are insertable in said spaces or removable therefrom only by relative endwise movement between the locking strips and knives.

9. In a plug for a Jordan engine, the combination of a plug body, a plurality of knives mounted on the surface on said body in circumferentially spaced relation, said knives being so shaped in cross section as to provide spaces therebetween which are wider at their bottoms than at their tops, means fitting in said spaces for locking the knives in operative position, and means radially spaced from said locking means for securing the latter in place.

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