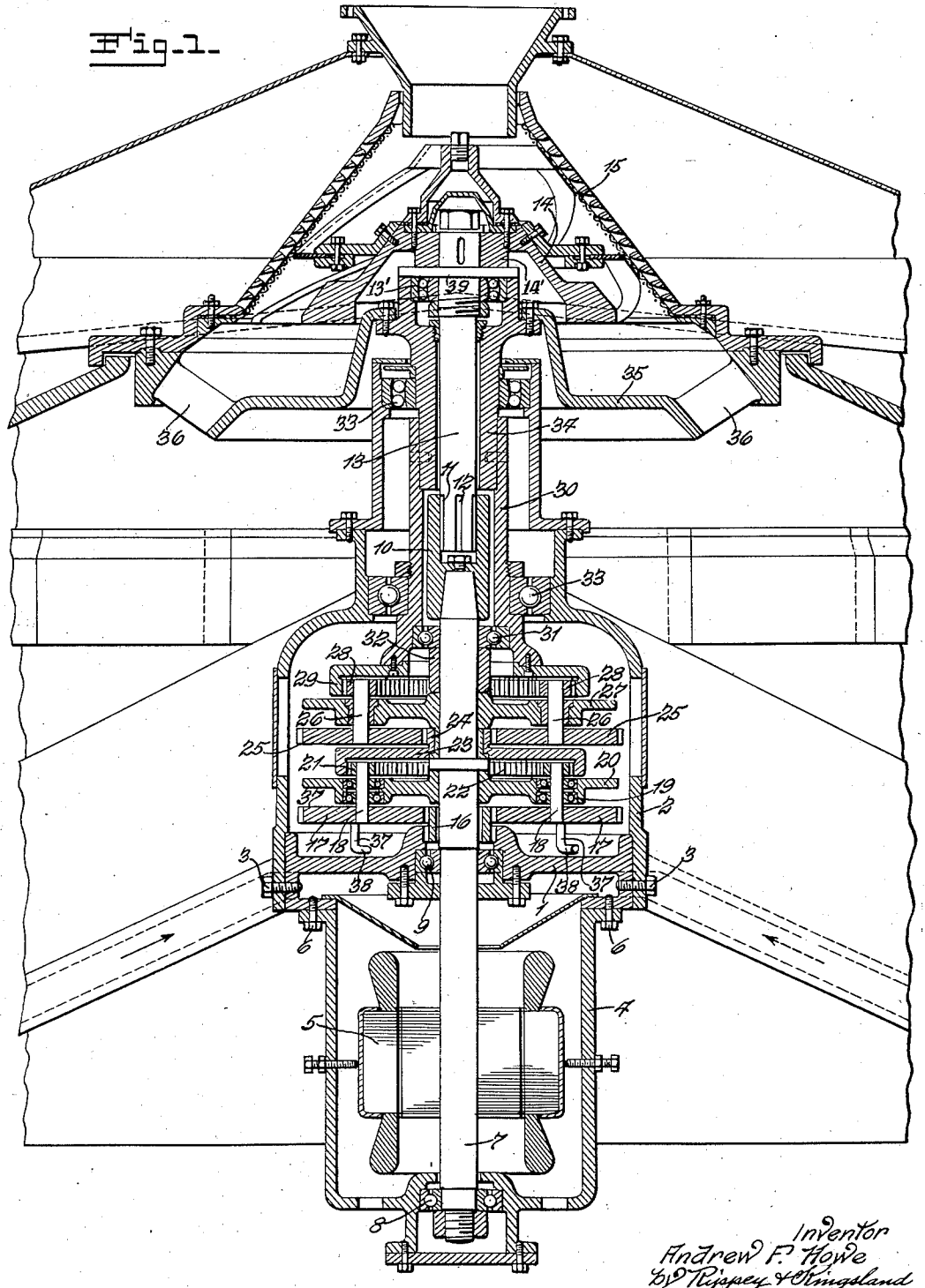
June 9, 1936. A. F. HOWE 2,043,661

CENTRIFUGAL DRIVING MECHANISM

Filed Aug. 10, 1934 3 Sheets-Sheet 1

Fig. 1.



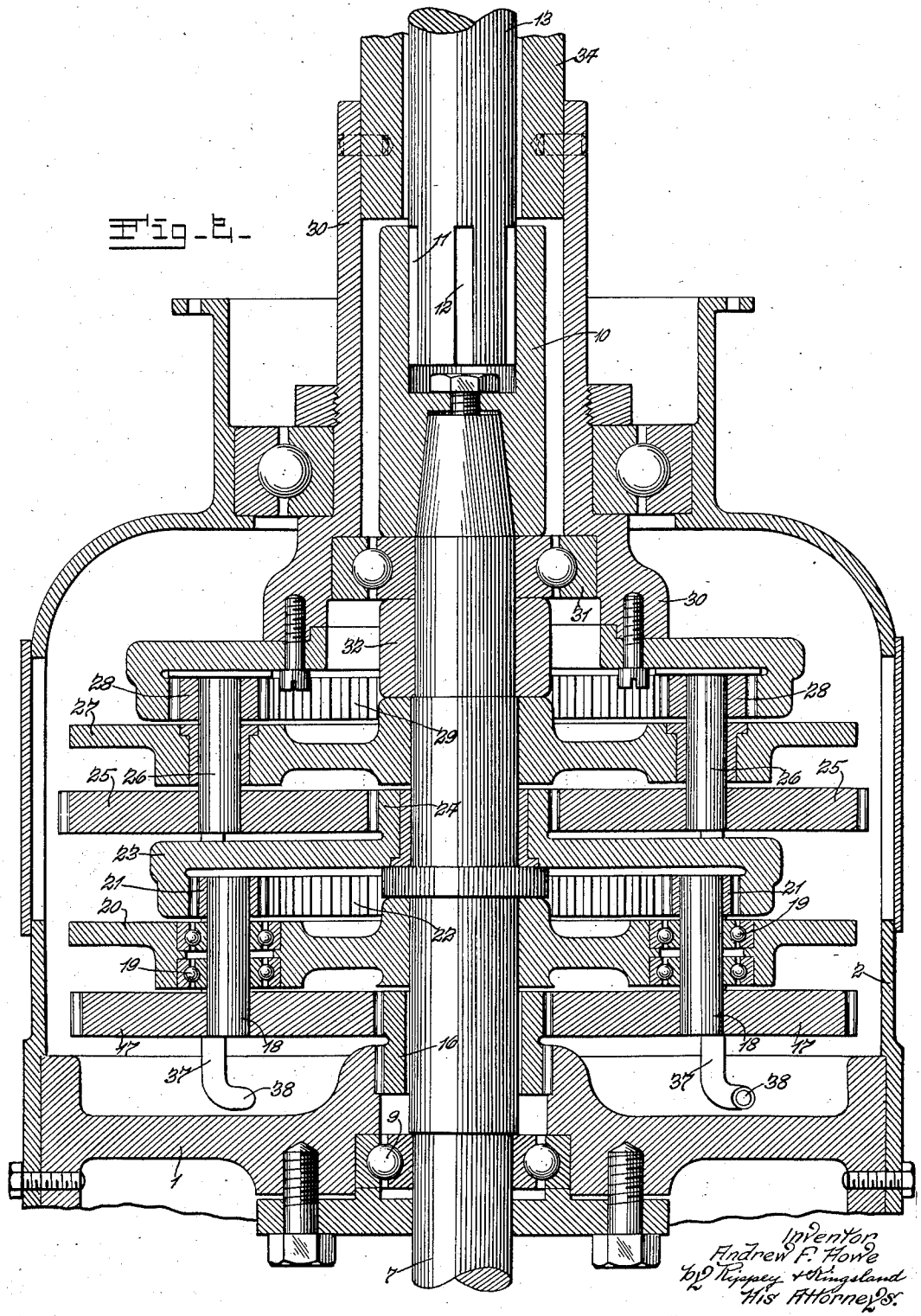
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Filed Aug. 10, 1934 3 Sheets-Sheet 2

Fig. 4.



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CENTRIFUGAL DRIVING MECHANISM

Filed Aug. 10, 1934 3 Sheets-Sheet 3

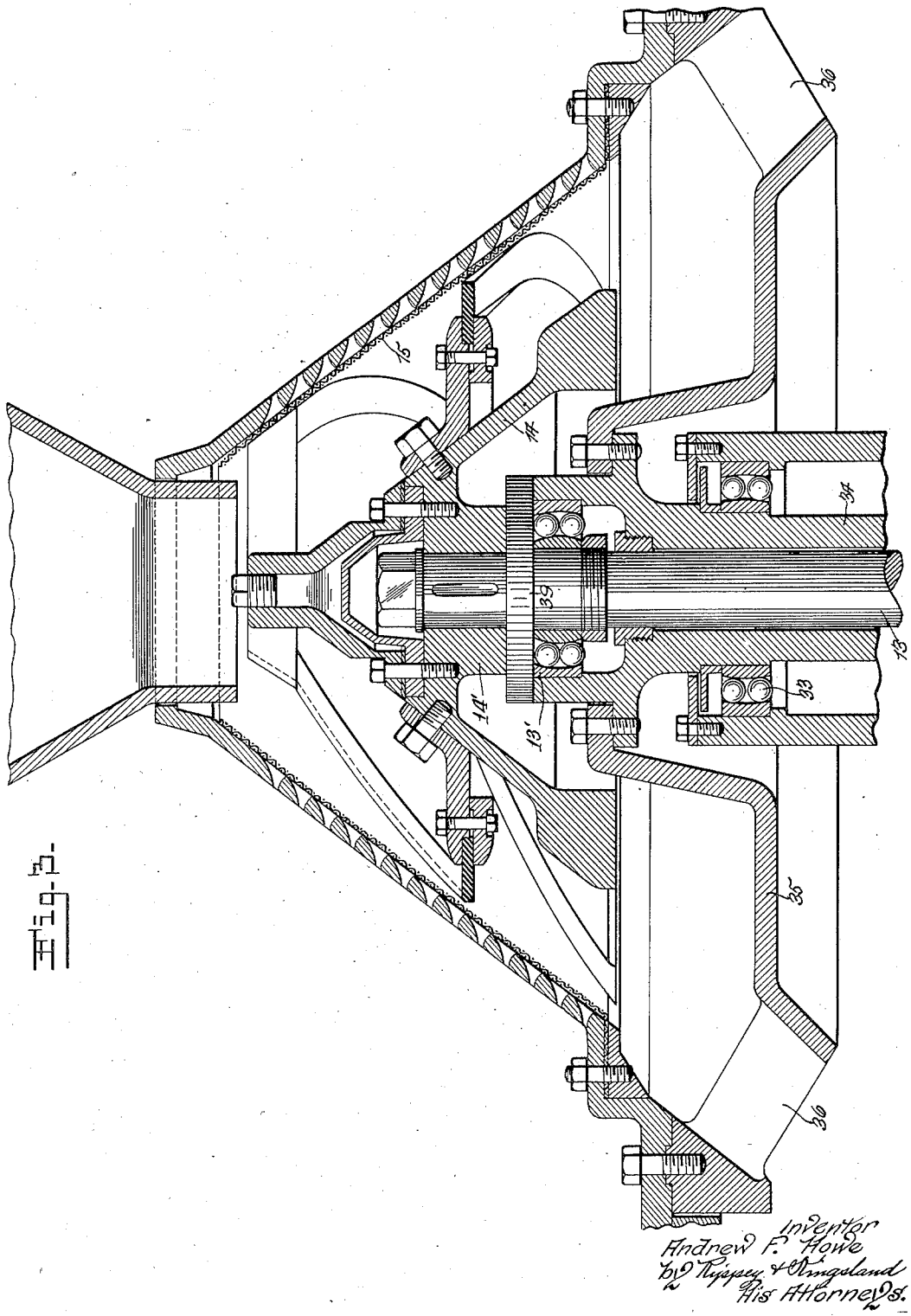


Fig. 5.

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CENTRIFUGAL DRIVING MECHANISM

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Application August 10, 1934, Serial No. 739,233

14 Claims. (Cl. 210—69)

This invention relates to centrifugal driving mechanism, and has special reference to a driving mechanism for use in centrifugal driers.

Objects of the invention are to provide improved mechanism for differentially rotating the screen and the distributing cone of a centrifugal drier at selected speeds; to provide means for connecting the differential driving mechanism with the screen and the distributing cone in such a way that the driving mechanism may be easily attached and detached; to provide a driving shaft supporting the differential driving mechanism and a removable support for said shaft whereby said shaft and said differential driving mechanism may be supported in operative connection with the screen and the distributing cone and may be easily removed therefrom when desired; and to provide improved driving mechanism attaining all of the benefits and advantages of the improved driving mechanism herein disclosed, reference being made to the annexed drawings, in which—

Fig. 1 is a vertical sectional view of the invention assembled in operative connection with the screen and the distributing cone of a centrifugal drier.

Fig. 2 is an enlarged sectional view of the differential driving mechanism.

Fig. 3 is an enlarged sectional view of the screen and the distributing cone.

A housing bottom plate 1 constituting the bottom wall of a housing is rigidly attached within the lower end of the housing 2 by removable and replaceable screws 3 and supports a motor housing 4 in which an electric motor 5 is mounted. The motor housing 4 is attached to the plate 1 by removable and replaceable screws 6. By this construction, the unitary assembly comprising the bottom plate 1 and the housing 4 constituting a stationary support that may be removed as a unit simply by removing the screws 3.

The shaft 7 is driven by the motor 5, the lower end of said shaft being journalled in a bearing 8 and the intermediate portion of said shaft being journalled in a bearing 9 in the bottom plate 1. A tubular coupling device 10 is rigidly attached to the upper end of the shaft 7 and is provided with internal ribs 11 adapted to engage in grooves 12 in the lower end of a vertical shaft 13 in axial alinement with the shaft 7. The shaft 13 is attached to the distributing cone 14 of the centrifugal drier, so that said cone will be rotated at the same speed at which the shafts 7 and 13 rotate. The coupling 10 is easily withdrawable from engagement with the lower end of the shaft 13 and may also easily be reengaged therewith. Accordingly, the coupling 10 does not interfere with the removal of the entire unit comprising the bottom plate 1, the housing 4, the shaft 7 and all of the gearing supported by any of said parts.

Differential gearing is mounted in connection with and is solely supported and operated by the shaft 7 for rotating the conical screen 15 of the centrifugal drier at a speed different from the speed of rotation of the distributing cone 14; and, in the present instance, the screen 15 is driven at a slower rate of speed than the cone 14.

The shaft 7 extends through a pinion 16 in rigid connection with the bottom plate 1, so that said pinion cannot rotate. A planetary series of gears 17 mesh with the pinion 16. The gears 17 are rigidly attached to trunnions 18 supported in bearings 19 mounted in a supporting member 20 which is rigid with the shaft 7 and, therefore, rotates at the same rate of speed as said shaft 7. The gears 17 are supported below the supporting member 20. Each trunnion 18 has a pinion 21 rigidly attached to its upper end above the support 20, and the series of pinions 21 mesh with an internal gear 22 formed in connection with a multiple gear 23. The gear 23 is coaxial with the shaft 7 and is supported thereby for free and independent rotation with respect to said shaft 7. The combination gear member 23 includes a pinion 24 as an integral part thereof, and said pinion 24 is coaxial with the combination gear 23 and the shaft 7.

A planetary series of gears 25 mesh with the pinion 24 and are supported by the lower ends of trunnions 26. The trunnions 26 are rotatively supported by a supporting member 27 rigid on the shaft 7, and each of said trunnions has attached to its upper end a pinion 28.

The pinions 28, which are rigid with the respective trunnions 26, mesh with an internal gear 29 attached to a tubular shaft 30. The upper end of the shaft 7 is journalled in a bearing 31 insertable in and withdrawable from the lower end of the tubular shaft 30 and supported on a sleeve 32 mounted on the shaft 7 above the support 27. When the screws 3 are removed the shaft 7 and the differential gearing supported thereby may be removed as a unit with the support comprising the parts 1 and 4.

Accordingly, by using gearing of the desired ratio, the tubular shaft 30 may be driven at any desired speed relative to the speed of rotation of the shaft 7. By using gears of one ratio, the tubular shaft 30 may be rotated at the same speed

as the shaft 7; and, by using gears of a different ratio, the tubular shaft 30 may be rotated faster than the shaft 7; and, by using the gears of still a different ratio, the tubular shaft 30 may be rotated slower than the shaft 7. My invention embodies this complete idea of means.

The tubular shaft 30 is supported by and rotative in a bearing 33 supported by the stationary housing 2. The upper end of the tubular shaft 30 is attached to the lower end of a tubular shaft 34 to the upper end of which the annular wall 35 is attached for rotation thereby. The annular wall 35 is connected with the screen 15 by webs 36 so that said screen 15 will be rotated thereby.

It is now clear that the motor 5 may be controlled to rotate the shaft 7 at any desired speed of rotation and that, by using proper ratio of gearing, the screen 15 may be rotated in the same direction as the distributing cone 14 and at uniform or any selected differential speed of rotation. Merely by removing the screws 3, the entire motor housing including the bottom plate 1 of the stationary housing 2 may be removed while the shaft 7 remains journalled in the bearings 8 and 9 and carries with it the differential gearing excepting the internal gear 29 which is supported by the tubular shaft 30. The gearing will be automatically and continuously lubricated when in operation by oil flowing through the tubes 37 supported vertically by the supports 20 and 27 between the gears 17 and having forwardly extended open portions 38 on their lower ends which operate in oil contained in the housing 2. The planetary rotation of the tubes 37 about the axis of the shaft 7 with the open end portions 38 of said tubes operating in the oil will cause continuous flow of oil through the respective tubes above the support 27. Discharge of the oil from the open upper ends of the tubes 37 will permit the oil to flow onto and lubricate all of the gearing and the bearings therefor.

As clearly shown the upper end of the shaft 13 is journalled in a bearing 13' mounted in and supported by the upper end of the tubular shaft 34. The hub 14' of the distributing cone 14 bears against and is supported by a flange or collar 39 and such flange or collar is supported by the bearing 13' and by the upper end of the tubular shaft 34. These elements constitute an embodiment of means for supporting the shaft 13 and thereby the distributing cone 14 by the shaft 34 and the bearing 13', even when the drive shaft 7 and the differential gearing mounted thereon are removed.

It should now be apparent that this invention attains all of its intended objects and purposes efficiently and satisfactorily and constitutes a highly convenient mechanism for its intended uses. The distributing cone 14 and screen 15 may be of any appropriate form or construction, and the present invention is capable of a wide variety of uses irrespective of the mechanisms or parts to be driven thereby.

I claim: —

1. Mechanism of the character described comprising spaced bearings, a shaft journalled in said bearings, an additional shaft in axial alinement with said first shaft, a coupling rigid with one of said shafts and having detachable engagement with the other shaft, a member rotative by said second shaft, an additional rotary member supporting said first rotary member, gearing supported by said first shaft for rotating said additional rotary member differentially with respect to said first member as desired, and a detachable support for said bearings whereby said first shaft and said gearing may be removed as a unit.

2. Mechanism of the character described comprising two members to be relatively rotated one about the other, a bearing supporting one of said members by the other, a shaft supporting one of said members, a drive shaft, means for rotating said first shaft by said drive shaft, differential gearing supported wholly by said drive shaft, connections operated by said differential gearing for rotating said other member differentially with respect to that member which is supported by said first shaft, and a detachable support for said drive shaft whereby said shaft and said gearing may be removed as a unit.

3. Mechanism of the character described comprising two members to be relatively rotated one about the other, a bearing supporting one of said members by the other, a shaft supporting one of said members, a drive shaft, means for rotating said first shaft by said drive shaft, differential gearing supported wholly by said drive shaft, connections operated by said differential gearing for rotating said other member differentially with respect to that member which is supported by said first shaft, and a detachable support for said drive shaft whereby said drive shaft and said differential gearing may be removed as a unit.

4. Mechanism of the character described comprising two members to be differentially rotated, a tubular shaft supporting one of said members, a shaft supporting the other one of said members and extending axially into said tubular shaft, a bearing in said tubular shaft supporting said second shaft, a drive shaft, means detachably connecting said drive shaft with said second shaft, differential gearing supported by said drive shaft, means for rotating said tubular shaft by said differential gearing, and means for supporting said drive shaft and thereby said gearing for removal or replacement as a unit.

5. Mechanism of the character described comprising two members to be differentially rotated, a tubular shaft supporting one of said members, a shaft supporting the other one of said members and extending axially into said tubular shaft, a bearing in said tubular shaft supporting said second shaft, a drive shaft, means detachably connecting said drive shaft with said second shaft, differential gearing supported by said drive shaft, means for rotating said tubular shaft by said differential gearing, and a removable support for said drive shaft whereby said drive shaft and said differential gearing may be removed and reassembled in cooperative relation with said tubular shaft and said first shaft as a unit.

6. Mechanism of the character described comprising a rigid housing, two members to be relatively rotated, a tubular shaft supporting one of said members, a shaft supporting the other member and extending into said tubular shaft, a bearing in said tubular shaft supporting said second shaft, a drive shaft, means for rotating said second shaft by said drive shaft, differential gearing supported by said drive shaft in said housing for rotating said tubular shaft differentially with respect to said second shaft, and a detachable support for said drive shaft whereby said drive shaft and said gearing may be removed as a unit.

7. Mechanism of the character described comprising a rigid housing, a tubular housing journalled for rotation in said housing, a shaft extending into said tubular shaft for relative rotation, a bearing in said tubular shaft supporting said second shaft, a drive shaft in axial aline-

ment with said second shaft, a detachable connection for rotating said second shaft by said drive shaft, differential gearing supported by said drive shaft in said housing and operatively connected with said tubular shaft for rotating said tubular shaft differentially with respect to said second shaft, and a detachable support for said drive shaft whereby said drive shaft and said gearing may be removed as a unit.

8. Mechanism of the character described comprising two coaxial shafts supported for relative rotation, a bearing in one of said shafts supporting the other shaft, a drive shaft supported in axial alinement with one of said two coaxial shafts and detachably connected therewith, a detachable support for supporting said drive shaft, and differential gearing wholly supported by said detachable support and said drive shaft and operatively connected with the other of said two coaxial shafts.

9. Mechanism of the character described comprising two coaxial shafts supported for relative rotation, a bearing in one of said shafts supporting the other shaft, a rigid housing supporting said shafts, a drive shaft in axial alinement with one of said two coaxial shafts and operatively connected therewith, differential gearing supported by said drive shaft and said housing for rotating the other one of said two coaxial shafts differentially with respect to said drive shaft, and a detachable support for said drive shaft whereby said drive shaft and said gearing may be removed as a unit.

10. Mechanism of the character described comprising a rigid supporting housing, a tubular shaft rotatively supported by said housing, a shaft extending into said tubular shaft and supported thereby for relative rotation, spaced bearings in said housing, a drive shaft rotatively journalled in said bearings in axial alinement with said second shaft and operatively connected therewith, differential gearing wholly supported by said drive shaft and operatively connected with said tubular shaft for rotating said tubular shaft differentially with respect to said drive shaft and said second shaft, a motor between said bearings for rotating said drive shaft, and a detachable support for said drive shaft and said motor whereby said shaft and said motor and said gearing may be removed as a unit.

11. Mechanism of the character described comprising a rigid housing, spaced bearings supported by said housing, a tubular shaft rotatively supported by said bearings, a shaft extending into said tubular shaft for relative rotation, a bearing in said tubular shaft supporting said second shaft, a detachable support attached to said housing, a drive shaft rotatively journalled in said detachable support and supported thereby in axial alinement with said second shaft, a detachable coupling for rotating said second shaft by said drive shaft and at the same rate of speed, and differential gearing wholly supported by said detachable support and said drive shaft in said housing and operatively connected with said tubular shaft for rotating said tubular shaft differentially with respect to said drive shaft and said second shaft.

12. Mechanism of the character described comprising a tubular shaft, a shaft extending into said tubular shaft for relative rotation, a bearing in said tubular shaft supporting said second shaft, a drive shaft coaxial with said tubular shaft and in axial alinement with said second shaft, a coupling having detachable connection with one of said two last named shafts for rotating said second shaft by said drive shaft and at the same rate of speed, a bearing in said tubular shaft for one end of said drive shaft, means on said drive shaft for supporting said bearing, differential gearing supported by said drive shaft for rotating said tubular shaft differentially with respect to said drive shaft and said second shaft, a support for supporting said drive shaft and said differential gearing in cooperative relation with respect to said second shaft and said tubular shaft, and detachable means holding said support whereby said support and said drive shaft and said gearing may be removed as a unit.

13. Mechanism of the character described comprising a tubular shaft, a shaft extending into said tubular shaft for relative rotation, a bearing in said tubular shaft supporting said second shaft, a drive shaft coaxial with said tubular shaft and in axial alinement with said second shaft, a coupling having detachable connection with one of said two last named shafts for rotating said second shaft by said drive shaft and at the same rate of speed, a bearing in said tubular shaft for one end of said drive shaft, means on said drive shaft for supporting said bearing, differential gearing supported by said drive shaft for rotating said tubular shaft differentially with respect to said drive shaft and said second shaft, a support for supporting said drive shaft and said differential gearing in cooperative relation with respect to said second shaft and said tubular shaft whereby said drive shaft and said gearing may be removed as a unit, and means supported and operated by said gearing for applying lubricant to said gearing as an incident to the operation thereof.

14. Mechanism of the character described comprising a tubular shaft, spaced bearings in said tubular shaft, a shaft journalled in one of said bearings and extending into said tubular shaft for relative rotation, a removable support, a drive shaft supported by said removable support and by one of said bearings coaxially with respect to said tubular shaft and in axial alinement with said second shaft, a coupling rigid with said tubular shaft and having detachable engagement with said second shaft for rotating said second shaft by said drive shaft, a gear member attached to said tubular shaft and operatively connected with said gearing for rotating said tubular shaft, and means for supporting said drive shaft and said differential gearing for removal and replacement as a unit.

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