S. R. & W. L. WAGG.

DRIVING MECHANISM FOR PAPER REFINING ENGINES.

APPLICATION FILED MAR. 23, 1910.

965,771. **Patented July 26, 1910.**

2 SHEETS—SHEET 1.

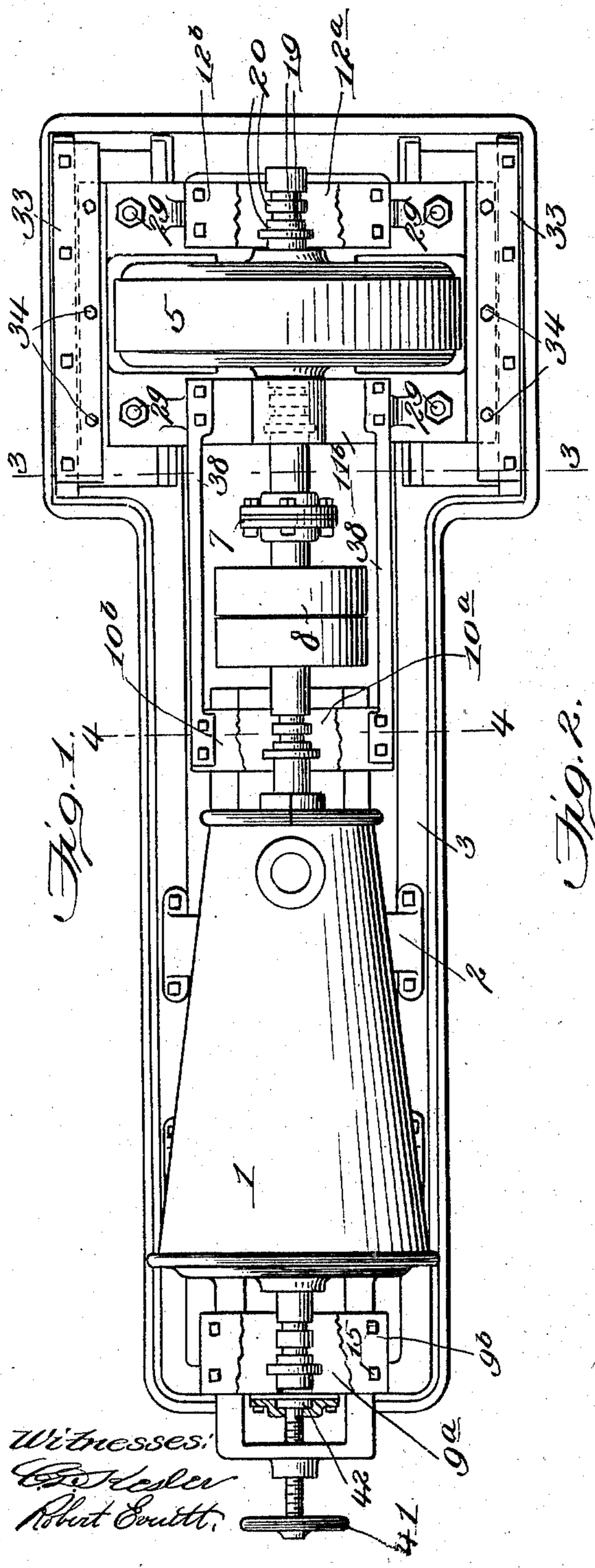

Fig. 1.

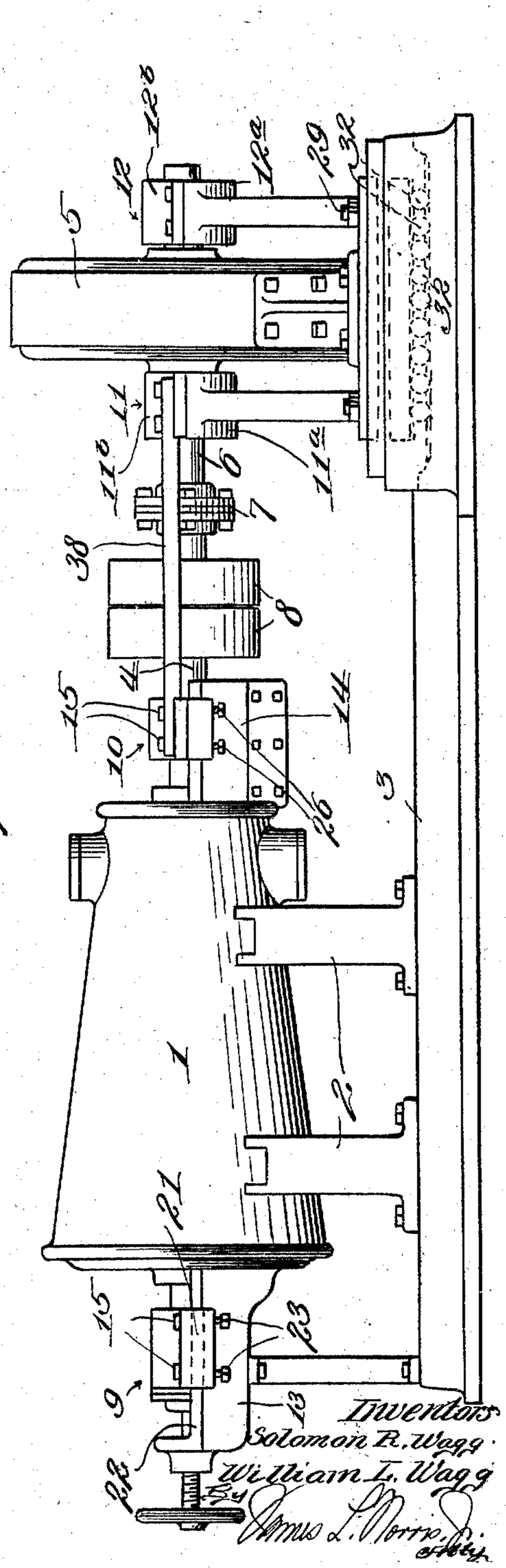

Fig. 2.

Witnesses:
C. F. Kesler
Robert Scutt.

Inventors
Solomon R. Wagg.
William L. Wagg
By James L. Norris.
Atty.

S. R. & W. L. WAGG.

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2 SHEETS—SHEET 2.

Fig. 3.

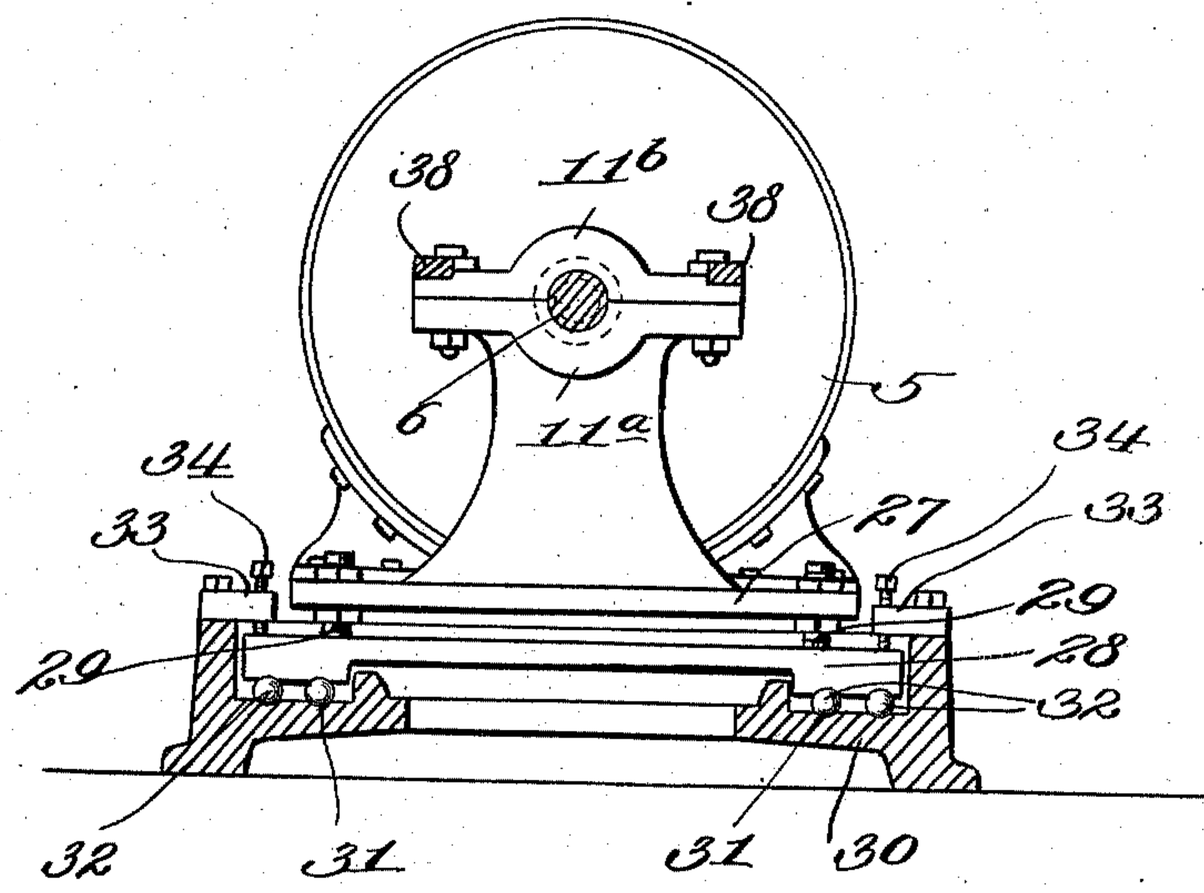


Fig. 4.

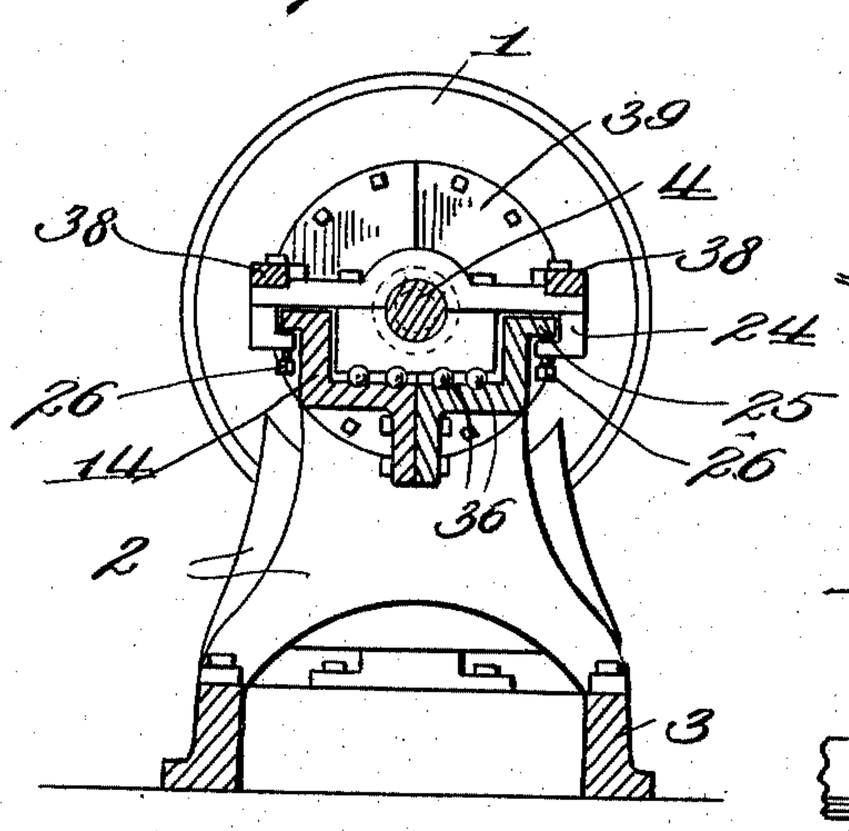


Fig. 5.

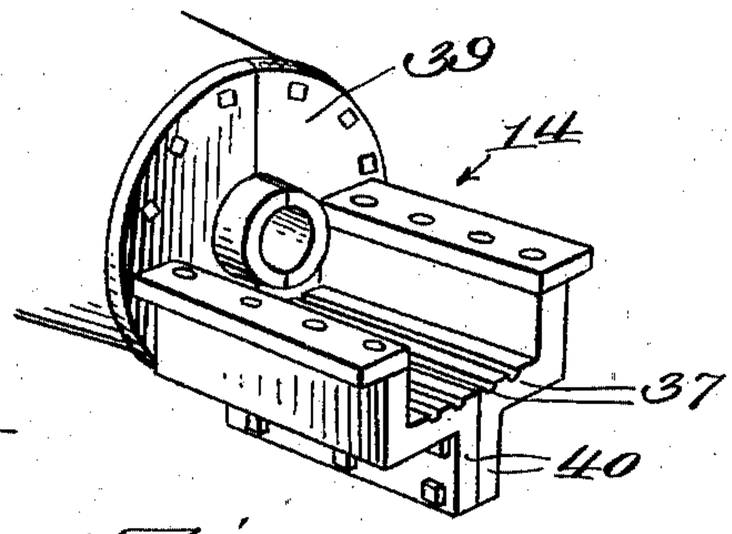
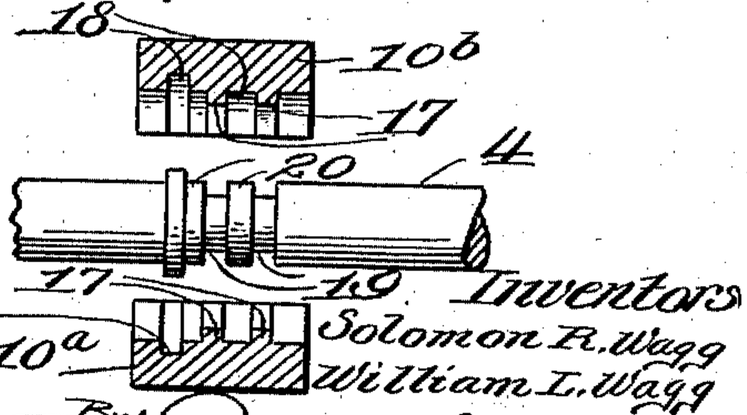


Fig. 6.



Witnesses:
C. E. Keeler
Robert Everett.

Inventors
Solomon R. Wagg
William L. Wagg
By
James L. Norris
Atty

UNITED STATES PATENT OFFICE.

SOLOMON R. WAGG AND WILLIAM L. WAGG, OF APPLETON, WISCONSIN, ASSIGNORS OF ONE-THIRD TO JAMES B. WAGG, OF APPLETON, WISCONSIN.

DRIVING MECHANISM FOR PAPER-REFINING ENGINES.

965,771. Specification of Letters Patent. **Patented July 26, 1910.**

Application filed March 23, 1910. Serial No. 551,197.

To all whom it may concern:

Be it known that we, SOLOMON R. WAGG and WILLIAM L. WAGG, citizens of the United States, residing at Appleton, in the county of Outagamie and State of Wisconsin, have invented new and useful Improvements in Driving Mechanism for Paper-Refining Engines, of which the following is a specification.

This invention relates to improvements in the driving mechanism of paper refining engines and particularly of paper refining engines of the Jordan type, which, as is well known, comprise a stationary frusto-conical shell within which rotates an endwise adjustable plug, the shell and the plug being provided with co-acting cutting knives, which, as the plug rotates, comminute or grind up the material in the shell. Up to a comparatively recent period, refining engines of the type stated were always belt driven. The disadvantages of a belt drive induced a motor driven design which, while highly efficient, yet fell short in some respects of overcoming the known disadvantages of the belt drive. Experience soon demonstrated the necessity for improving the motor driven design of engine and various improvements have been proposed to increase its efficiency. One of the aforesaid improvements proposed the organization of the engine in such a manner that the plug shaft and the motor shaft were connected to constitute, in effect, a continuous shaft, common to the plug and the motor, whereby the motor and the plug might have simultaneous and coextensive endwise movements, when the plug was adjusted endwise of the shell, to take up the wear of the knives. This construction still failing to attain that degree of efficiency which is mandatory, a subsequent improvement was proposed, in which all the functions of the construction specifically referred to, were preserved, but independent means were employed to effect the endwise simultaneous movements of the plug and the motor, and such is the state of the art at the present time. The last improvement referred to, viz. that in which independent means are employed to effect the endwise simultaneous movements of the plug and the motor, is much more complicated, cumbersome, and expensive, than the construction which it was designed to supplant, and in addition, provides for some degree of loose play, which interferes with the proper relation of the parts during the operation of adjusting the position of the cone. Therefore, it became apparent to us that the first construction, *i. e.*, that in which the shafts of the motor and of the plug are connected to form a common shaft, if improved to eliminate its disadvantages while still retaining its advantages, would be superior in a number of respects to the construction by which it was supplanted, viz. that which involves the independent means for effecting endwise simultaneous movements of the plug and the motor.

As is well known, the chief difficulty in the driving of Jordan plugs is the effect of the lateral displacement or sagging of the plug, incident to its tremendous weight, in causing the binding of the shaft in its bearings, and consequently interfering with the operation of the machine, both as to driving and as to adjusting. We have discovered that the lateral displacement or sagging of the plug can be overcome or rendered practically negligible, by a proper relative positioning of the bearings, computed with regard to the weight and stresses on the common shaft of the plug and motor, and we have utilized this fact in the development of a practical machine wherein the motor shaft and the plug shaft are connected to form, in effect, a common shaft for the motor and the plug, in order that said motor and plug may have endwise simultaneous movements consequent to an endwise movement of the shaft and wherein the disadvantages of the first type of machine involving this organization, are eliminated.

According to the present invention, the bearings for the common shaft are mounted for endwise movement with said shaft, whereby their proper relation will always be preserved. This organization differs from the known construction in that, in the latter, the bearings are stationary and the shaft movable axially with relation thereto, as a consequence of which an adjustment of the plug destroyes the proper relation of the bearings. By virtue of our construction referred to, we are enabled to use both a motor drive and a belt drive. This is a fact of material consequence, since in certain places or in certain seasons, there are no facilities for obtaining electric power. The invention also improves the organiza-

tion of engines of the type stated by features of construction whereby, during the operation of adjusting the plug, the stress incident to the weight of the motor is taken from the shaft coupling. The invention also improves the organization of engines of the type stated, by features of construction which provide for a more ready assemblage and disassemblage of the parts. Withal, the construction proposed is of simple, durable and inexpensive nature.

A preferred embodiment of the invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a top plan view of the improved refining engine, with parts broken away for the sake of clearness; Fig. 2 is a side elevation thereof; Fig. 3 is a transverse section on the line 3—3 of Fig. 1; Fig. 4 is a transverse section on the line 4—4 of Fig. 1; Fig. 5 is a detail perspective view of a supporting bracket for one of the movable bearings; and Fig. 6 is a detail sectional view showing the relation of the bearing parts and the shafts.

Similar characters of reference designate corresponding parts throughout the several views.

The engine proper includes the usual frusto conical shell, as 1, supported by brackets, as 2, from a base, as 3, and containing the usual conical plug, (not shown) which is mounted upon and driven by a shaft, as 4, projecting from each end of the shell 1. At the end of the base 3 opposite to the shell 1, an electric motor, as 5, is mounted, and its shaft, as 6, is coupled to the shaft 4 by an approved coupling, as 7. The shafts 4 and 6, being thus coupled by the device 7, form, in effect, one continuous shaft, common to the plug and to the motor. In environments where electric power cannot be obtained, the driving of the plug may be effected by a belt transmission, and for this purpose the shaft 4 may be provided with belt pulleys, as 8. These are of split construction in order that their assemblage and removal may be effected without interference with the rest of the organization.

The shaft 4 is journaled in and supported by bearings, as 9 and 10, and the shaft 6 is journaled in and supported by bearings, as 11 and 12. The bearings 9 and 10 are of generally similar construction, the former being associated with the tail box 13 supported adjacent the large end of the shell 1, and the latter being associated with a bracket, as 14, supported adjacent the small end of the shell 1. Each of the bearings aforesaid is of two-part construction, comprising lower members 9^a, 10^a, 11^a and 12^a, respectively, and upper members 9^b, 10^b, 11^b and 12^b, respectively. The companion members of each bearing are connected by bolt fastenings, as 15, and are associated with the shaft for endwise movement therewith. The preferred means of thus associating the bearings and the shaft is shown in detail in Fig. 6. In this preferred construction the bearing members are provided with longitudinal recesses to receive the shaft and with ribs, as 17, and grooves, as 18, extending transversely of the shaft. The latter is formed with grooves, as 19, to receive the aforesaid ribs 17 and with ribs, as 20, to fit into the aforesaid grooves 18. The ribs 17 and 19 thus constitute, in effect, thrust rings to prevent end play of the shaft and to couple the shafts and the bearings in order that the latter may move axially with the former.

The lower bearing members 9^a, 10^a, 11^a and 12^a are movably associated with their respective supports. Means are provided, however, for securing the bearings immovable during the normal operation of the engine, the securing means being operable to permit of the movement of the bearings aforesaid, during the operation of adjusting the position of the plug.

The bearing member 9^a is fitted for axial sliding movement in the tail box 13 and the member 9^b is imposed on the member 9^a, secured thereto by the bolts 15 as aforesaid and constructed to hold the bearing 9 in proper relation to the tail box and against vertical and lateral displacement. Toward this end, the member 9^b is provided at its sides with depending inturned or angle iron flanges, as 21, which fit over flanges, as 22, provided at the sides of the tail box 13. The means above referred to for holding the bearing 9 immovable, consists, advantageously, of screws, as 23, which are threaded through the flanges 21 and are arranged to have frictional engagement with the flanges 22.

The bearing member 10^a is fitted for axial sliding movement in the bracket 14 and the member 10^b is imposed on the member 10^a, secured thereto by the bolts 15 as aforesaid, and constructed to hold the bearing 10 in proper relation to the bracket 14 and against vertical and lateral displacement. Toward this end, the member 10^b is provided at its sides with depending inturned or angle iron flanges, as 24, which fit over flanges, as 25, provided at the sides of the bracket 14. The means above referred to for holding the bearing 10 immovable consists, advantageously, of screws, as 26, which are threaded through the flanges 24 and are arranged to have frictional engagement with the flanges 25.

The bearing members 11^a and 12^a are preferably formed integral with a plate, as 27, upon which the motor 4 is mounted and which is in turn supported with relation to a carriage plate, as 28. The plates 27 and 28 are connected by screw posts, as 29, which

provide for such adjustments of the height of the motor as may be necessary to insure proper alinement of the parts. The plate 28 is in turn supported with relation to a base, as 30, and is movable axially thereof. The base 30 has at its sides longitudinal channels, as 31, which receive thickened side portions of the plate 28 and in which are fitted ball bearings, as 32, upon which the plate 28 rests. At the sides of the base 30, longitudinal bars, as 33, are provided, which overhang the plate 28 and through which are threaded screws, as 34, arranged to have frictional engagement with the plate 28 and employed to hold the latter normally against displacement. The members 9^a and 10^a aforesaid, may be constructed to run on ball bearings in the same manner as the plate 28. The member 10^a is so shown, the ball bearings 36 upon which said member rests, being disposed in longitudinal grooves, as 37, in the base of the bracket 14. For the purpose of taking from the coupling 7 such stresses as are incident to the weight of the motor, during the operation of adjusting the position of the plug, the bearings 10 and 11 may be positively connected by longitudinally disposed tie bars, as 38.

To facilitate the assemblage and disassemblage of the engine, the head, as 39, which closes the smaller end of the shell 1 may be of two-part construction, as shown in Fig. 5, and the bracket 14, which is preferably made as one with said head, is also of two-part construction, its sections being coupled by fastenings which pass through abutting depending longitudinal flanges, as 40. By virtue of this construction, the head 39 and bracket 14 may be removed by disuniting their parts, and the shaft 4, together with its half of the coupling 7, may be moved through the smaller end of the shell 1.

For the purpose of effecting the adjustment of the cone, the usual hand wheel, as 41, is employed. The threaded staff of this wheel is fitted in the tail box, and its end is connected by a swivel joint, as 42, to the bearing 9.

The manner in which the invention attains the advantages preliminarily outlined, will be readily apparent from the foregoing description. As was stated, the adjustment of the plug is effected by turning the hand wheel 41. This produces an axial movement of the shaft 4 and therewith of the plug. The bearings 9 and 10 also partake of this axial movement and thus their relations, established to provide against sagging or lateral displacement of the plug, are accurately preserved. At the same time, in the case of a motor drive, the bearings 11 and 12, as well as the motor, are moved simultaneously and coextensively with the shaft 4 through the medium of the coupling 7 between said shaft and the shaft 6 and also of the tie bars 38, and thus the relations of the bearings 11 and 12 are accurately preserved. Hence the adjustment of the plug is not an inducement to its lateral displacement and to the consequent binding of the shafts in their bearings and interference with the operations of driving and adjusting. The construction of the bearings *per se* is of advantage in that it involves efficient provision for taking up end thrust of the shafts. The provision of the tie bars 38 is of advantage in taking stresses from the coupling 7. By virtue of the latter, the motor may be put out of service at any time and a belt drive employed. This is accomplished by removing the bolts which connect the parts of the coupling. The construction of the bracket 14 and the head 39 is of advantage in that it provides for the ready assemblage and disassemblage of the machine. The manner of mounting the movable parts is of advantage in that it provides for an easy and frictionless adjusting operation. In fact, in addition to the ball bearings aforesaid, to eliminate friction, the parts may be constructed to run in oil and the base construction of the motor is, in fact, so shown.

The machine as an entirety is self-contained and may be shipped in a completely organized condition and its construction provides for an absolutely true relation and alinement of the parts at all times and under all conditions.

Having fully described our invention, we claim:

1. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, means for moving the shaft axially, bearings associated with the shaft at opposite ends of the plug for axial movement therewith and stationary supports for the bearings.

2. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, a motor to furnish the driving power for the plug, coupled shafts for the plug and the motor, means for moving the shafts axially, bearings associated with the shafts for axial movement therewith, stationary supports for the bearings, a movable carriage plate upon which the motor is imposed, and a stationary support for the carriage plate.

3. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, a motor for furnishing the driving power, a motor shaft alined with the first-named shaft, a coupling between the shafts, means for effecting an axial movement of the first-named shaft and therewith of the plug, the motor and the motor shaft, bearings associated with the

shafts for axial movement therewith, a carriage plate upon which the motor and the motor shaft bearings are supported, a stationary support for the carriage plate, and stationary supports for the bearings of the first-named shaft.

4. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, a motor for furnishing the driving power, a motor shaft, means for effecting an axial movement of the first-named shaft and therewith of the plug, bearings associated with the shafts for axial movement therewith, a carriage plate upon which the motor and the motor shaft bearings are supported, a stationary support for the carriage plate, stationary supports for the bearings of the first-named shaft, and tie bars connecting the two adjacent bearings of the plug carrying shaft and the motor shaft.

5. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, a motor for furnishing the driving power, a motor shaft, means for effecting an axial movement of the first-named shaft and therewith of the plug, bearings associated with the shafts for axial movement therewith, a carriage plate upon which the motor and the motor shaft bearings are supported, a stationary support for the carriage plate, stationary supports for the bearings of the first-named shaft, tie bars connecting the two adjacent bearings of the plug carrying shaft and the motor shaft, and a coupling between said shafts.

6. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, means for moving the shaft and therewith the plug, axially, bearings associated with the shaft at opposite ends of the plug for axial movement therewith, stationary supports for the bearings, and fastening means for holding the bearings normally against displacement.

7. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, means for moving the shaft axially, two-part bearings associated with the shaft at opposite ends of the plug, thrust ring connections between the shaft and the bearings to provide for the movement of the latter axially with the former, and stationary supports for the bearings.

8. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, means for moving the shaft and therewith the plug axially, two-part bearings associated with the shaft for axial movement therewith, and flanged supports in which the lower member of each bearing is mounted, the upper member of each bearing having angle iron flanges for engagement with the flanges of the supports.

9. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted in the shell, of a shaft carrying and driving the plug, means for moving the shaft and therewith the plug axially, two-part bearings associated with the shaft for axial movement therewith, flanged supports in which the lower member of each bearing is mounted, the upper member of each bearing having angle iron flanges for engagement with the flanges of the supports, and screws threaded through the angle iron bearings and arranged for frictional engagement with the flanges of the supports.

10. In a refining engine, the combination with a stationary shell, a cutting plug rotatably mounted therein, of a shaft carrying and driving the plug, a motor for furnishing the driving power, a motor shaft, a coupling between the shafts, a two-part head at the inner end of the shell, a two-part bracket associated with the head, and a shaft bearing supported by the bracket.

11. In a refining engine, the combination with a stationary shell, a cutting plug rotatably mounted therein, of a shaft carrying and driving the plug, a motor for furnishing the driving power, a motor shaft, a coupling between the shafts, a two-part head at the inner end of the shell, a shaft bearing adjacent the inner end of the shell, and a support for the shaft bearing, the latter being removable from the support.

12. In a refining engine, the combination with a stationary shell and a plug rotatably mounted therein, of a shaft carrying and driving the plug, means for effecting an axial movement of the shaft and therewith of the plug, bearings associated with the shaft at opposite ends of the plug for axial movement therewith, stationary supports for the bearings, and roller bearings interposed between the bearings and the supports.

13. In a refining engine, the combination with a stationary shell and a plug rotatably mounted therein, of a shaft carrying and driving the plug, a motor and a motor shaft alined with the plug carrying shaft, means for effecting axial movements of the latter, bearings associated with the shafts for axial movement therewith, connections to cause the motor shaft and therewith the motor to move axially with the plug carrying shaft, stationary supports for the bearings of the latter, a plate upon which the motor and the motor shaft bearings are imposed, a movable carriage plate, screw posts connecting said

plates and a stationary support for the carriage plate.

14. In a refining engine, the combination with a stationary shell and a cutting plug rotatably mounted therein, of a shaft carrying and driving the cutting plug, means for moving the shaft and therewith the plug axially, a motor and a motor shaft, connections to cause the motor shaft and therewith the motor to move axially with the plug carrying shaft, a plate upon which the motor is imposed, a movable carriage plate, screw posts connecting said plates and a stationary support for the carriage plate.

15. In a refining engine, the combination with a stationary shell and a plug rotatably mounted therein, of a shaft carrying and driving the plug, a motor and a motor shaft alined with the plug carrying shaft, means for effecting axial movements of the latter, bearings associated with the shafts for axial movement therewith, connections to cause the motor shaft and therewith the motor to move axially with the plug carrying shaft, stationary supports for the bearings of the latter, a movable carriage plate by which the motor is supported, a stationary base upon which the carriage plate runs, and longitudinal bars arranged at the sides of the base and overhanging the carriage plate.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

SOLOMON R. WAGG.
WILLIAM L. WAGG.

Witnesses:
GEO. H. PURENBOOM,
P. L. SCHUELLER.