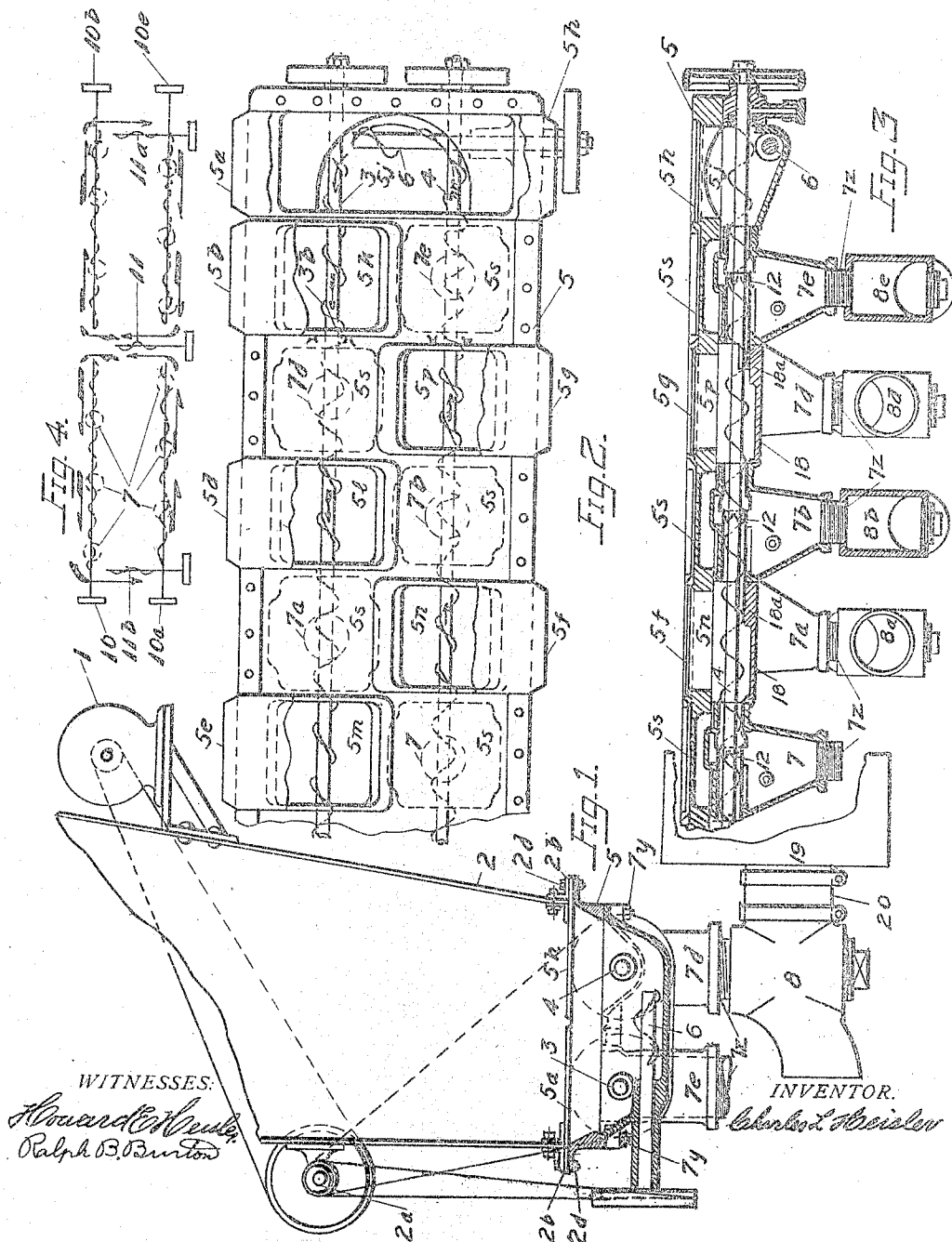


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 APPLICATION FILED MAY 20, 1916.

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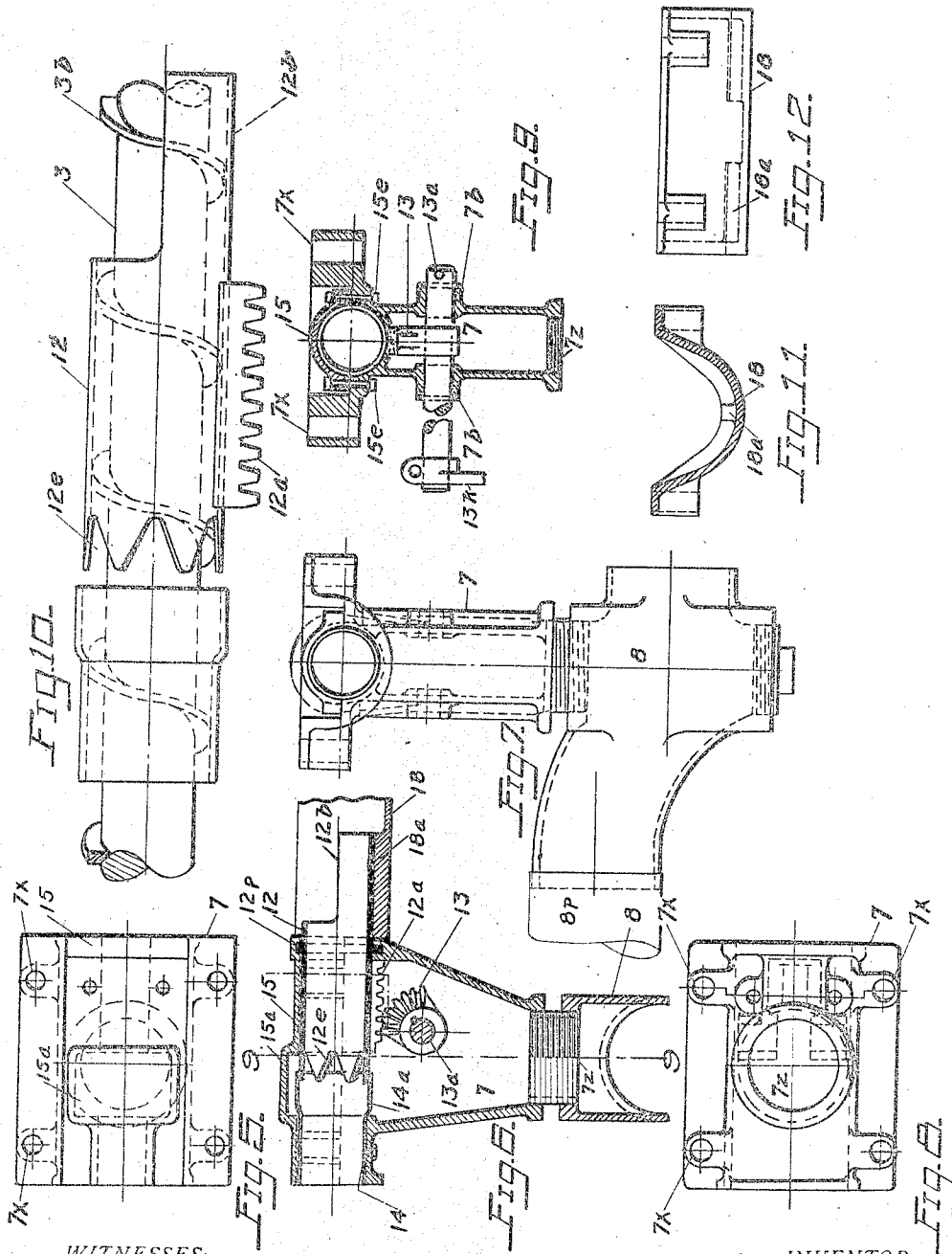
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UNITED STATES PATENT OFFICE.

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COMMUNUTED-FUEL-FEEDING APPARATUS.

1,237,334.

Specification of Letters Patent.

Patented Aug. 21, 1917.

Application filed May 20, 1916. Serial No. 98,846.

To all whom it may concern:

Be it known that I, CHARLES L. HEISLER, of Schenectady, in the county of Schenectady and State of New York, have invented a certain new and useful Improvement in Communitated-Fuel-Feeding Apparatus, of which improvement the following is a specification.

My invention relates more particularly to means for controlling the flow of powdered fuel from a hopper into an air blast which conveys the fuel and air mixture to a furnace.

The objects of my invention are to provide an effective and simple means for changing the rate of feed when operating a feed screw at practically constant speed; to provide means whereby the fuel lying upon and adjacent to the screw is continually agitated and moved along a path parallel with the screw in a manner to prevent clogging and to convey fuel to any desired number of adjustable outlets arranged along one, or more feed screws; to provide an effective safeguard against clogging the screw and related parts when one, or more feed outlets therefrom are closed; to provide a simple and effective hopper bottom and slide controlled outlet ports which will shut off the fuel and permit ready access to any section of the screw and feed valves without interrupting the operation of other feed screws that may be attached to the hopper bottom and to provide an improved form of fuel feed valve and supporting casings therefor.

In the accompanying drawings, Figure 1, is an elevation, of which part is in section for the purpose of showing the application of my improvement to a pulverized coal feeding hopper of usual construction; Fig. 2, a plan view of my improved hopper bottom and arrangement of feed screws; Fig. 3, a longitudinal sectional elevation thereof; Fig. 4, a diagrammatic plan view of the feed screws; Fig. 5, a plan view of a feed valve with screw omitted; Fig. 6, a sectional elevation thereof; Fig. 7, an end exterior view; Fig. 8, a bottom view thereof; Fig. 9, a transverse sectional elevation taken on the vertical plane 9, 9, of Fig. 6; Fig. 10, an enlarged detail of a screw section and feed valve; Figs. 11, and 12, details of a valve casing spacer.

For the purpose of obtaining simplicity,

low cost of installation and maintenance, in the practice of my invention, it is preferred to drive several screws with a single motor, in preference to using an independent variable speed motor for each feed, therefore, as shown in Fig. 1, a single motor 1, supported on the hopper 2, is belted to a countershaft 2^a, from which the screws 3 and 4, are driven, preferably by belts and pulleys. I do not, however, limit myself to this arrangement of drive, as the screws may be driven in any effective manner without departing from the spirit of my invention.

An outwardly projecting and horizontally disposed flange 2^b, is formed on the lower extremity of the hopper 2, in a manner to form a support and bolting face for the multiported feed valve casing supporting member or hopper bottom 5, secured thereto by the bolts 2^c. A plurality of hopper port closing slides 5^a, 5^b, 5^c, 5^d, 5^e, 5^f and 5^g, are mounted upon the bottom and over their corresponding outlet ports, 5^f, 5^g, 5^h, 5ⁱ, 5^j, 5^k, 5^l, formed in the bottom. The pair of end slides 5^a and 5^g, are arranged to cover a transversely disposed conveyer screw 6. The spaces in the bottom between the slides 5^b, 5^c and 5^d, consist of thin sections 5^e, and the slides covering the screw 3, are disposed alternately with the slides covering the parallel adjoining screw 4, said sections 5^e forming a cover over each of the feed valve casings 7, 7^a, 7^b, 7^c and 7^d, which have feed discharge outlets 7^e, formed thereon as shown in Figs. 2 and 3. Evidently by closing all the slides the several feed valves and screws may be removed from the hopper bottom. If desired, the hopper slides 5^b, 5^c, 5^d, 5^e and 5^f, could be closed to permit the removal, or examination of the screw 3, without discontinuing the operation of the screw 4. In like manner the screw 4, could be removed by closing its slides 5^f, 5^g, 5^h and 5ⁱ, without disturbing the feed screw 3.

The feed valve casings of the two screws are staggered for the purpose of conveniently connecting them with the air blast T's 8, 8^a, 8^b, 8^c and 8^d, which are disposed adjacent to each other and are connected to an air blast manifold 19. The fuel which is fed by the screws into the valves, drops down into the T's, mixes with the air blast and is carried to a flame within a furnace in the usual manner.

Fig. 4, illustrates, diagrammatically, the

flow of fuel around two circuits formed by four parallelly disposed feed screws 10, 10^a, 10^b, 10^c, and the three transversely disposed conveyer screws 11, 11^a and 11^b. The transverse conveyer screws are shown disposed under the feed screws. Practice has demonstrated that a screw, when rotated, will not clog if the fuel is continually taken away from its discharge end, that is from the end toward which the fuel is carried. Furthermore, it was found that by maintaining a free discharge through the last valve, of a series of valves, fed by a screw, that is, the valve located at the discharge end of the screw, the screw will not clog, nor when the fuel is carried away from the discharge end by any other means, as for example, by the transverse conveyer screws, 11, 11^a or 11^b, which are made use of when it is desired to make the feed valves adjustable so they can all be closed while the screws are rotating. Furthermore, when using a single screw and a plurality of feed valves, to govern the feed without change of rotative speed, it is necessary to omit the adjustable feature on one feed valve, disposed at the discharge end of the screw, to insure a free outlet to all fuel conveyed thereto by the screw.

The feed valve and adjustment comprise a comparatively long movable valve sleeve 12, preferably made of copper tubing, disposed axially with the screw and which snugly embraces the screw 3, but with sufficient freedom to permit rotation of the screw and a longitudinal adjustment of the sleeve by means of the rack 12^a, which meshes with a manually operable segmental pinion 13. This pinion is keyed to the valve feed adjusting shaft 13^a, and is inclosed within the valve casing 7, which has adjusting shaft bearings 7^b, formed thereon. The sleeve end 12^b, which protrudes into any of the hopper bottom outlet ports, is cut away on its upper side to avoid retarding the flow of fuel to the screw. The opposite end is provided with pointed ends forming V shaped notches or ports 12^c, adapted to enter the enlarged or bell end 14^a of the stationary sleeve 14, in a manner to give a gradual adjustment of flow of the fuel which is conveyed thereto by the screw. The flow of fuel is completely shut off when the notch ports are covered by the stationary sleeve bell end 14^a. To give perfect freedom and a steady flow to the fuel in its passage from the screw into the casing 7, an annular passage 15^a, communicating with the casing 7, is formed in the valve cap 15, in a manner to register with the ports 12^c. I do not limit myself to cutting the V notches in the valve sleeve 12, as they evidently can be cut in the bell end 14^a. However, preference is given to the construction illustrated because the powdered fuel cannot be packed at the bottom of the bell by the pointed ends of the valve

sleeve. The helix 3^b, is formed from a rectangular piece of steel and is forced tightly upon the screw shaft. This helical member has a shear, or sliding action over the V ports and effectively clears them from coal and prevents clogging. The movement of the helix over the several ports gives a very uniform delivery of fuel by causing it to discharge freely and continuously through each succeeding port into the annular space 15^a, formed around the belled and notched valve sleeve ends. To prevent leakage, a felt packing box 12^d, is formed around and near the right end of the sleeve 12. The cap 15, is fastened to the valve casing 7, by the bolts 15^c. The casing 7, is fastened to the hopper bottom by bolts 7^c, which pass through the holes 7^x, formed in the casing. The cap 15, serves as a guide for the sleeve 12, secures the stationary sleeve 14 in place and prevents undesired flow of fuel into the casing. The bearing 18^a, formed on the valve casing spacer 18, gives a support to the protruding end of the valve sleeve 12, to prevent the gear and rack action from cramping it in the casing and on the screw. These semi-cylindrical spacers are made the same length as the casings, for interchangeability and simplicity in manufacture.

The casing spacer 18, is preferably cast separate from the casing, as shown, this construction being preferred because it permits a ready removal to give convenient access to the screw after closing the corresponding hopper slide to prevent a discharge of fuel, when it is necessary to remove a foreign substance from the feeder. The spacer forms a removable feed screw chamber and incloses a section of the screw and space directly under a hopper port and slide. The spacer is fastened to the multiported member or hopper bottom 5 by the bolts 18^b.

What I claim is:

1. In a comminuted fuel feeder, the combination of a hopper bottom having a plurality of alined fuel outlets, a shut-off slide for each outlet, a feed screw beneath said outlets, a feed valve casing surrounding said screw between adjacent outlets and having a discharge opening below said screw, a sleeve fixed to each of said casings around said screw and having an enlarged end, a valve sleeve slidable in each of said casings and having a notched end fitting within said enlarged end of the fixed sleeve, and means to slide each of said valve sleeves to control the rate of feed.

2. The combination in a comminuted fuel feeder, of a rotary feed screw, a feed valve sleeve embracing a section of the screw, a second valve sleeve embracing an adjoining section of the screw and having a bell formed on one end thereof adapted to embrace an adjacent end of the other sleeve, a casing adapted to support the sleeves, and

means for adjusting one of the sleeves to and from the other sleeve for the purpose of governing the feed.

3. In a comminuted fuel feeder, the combination of a hopper bottom having a fuel outlet, a feed screw beneath the same, a casing, having a fuel discharge opening, mounted beneath said bottom to one side of said outlet and supporting said screw, said casing having a semi-circular recess formed in its upper part, a sleeve secured in said casing and having an enlarged end lying within said recess, a valve sleeve slidably mounted in said casing and having a notched end fitting within said enlarged end, the upper part of said valve sleeve being cut away beneath said outlet to receive the fuel therefrom, and means to slide said valve sleeve.

4. The combination in a comminuted fuel feeder, of a rotary feed screw, an adjustable feed valve sleeve disposed axially with the screw, a casing having a fuel outlet, a feed port formed around the valve sleeve and screw, an annular passage arranged around the valve sleeve and screw in a manner to permit a free flow of fuel from the feed port at any point around the valve sleeve and screw to said outlet, and means for adjusting said valve sleeve to govern the feed.

5. The combination in a comminuted fuel feeder, of a rotary feed screw, an adjustable feed valve sleeve disposed axially with the screw, means for adjusting the valve sleeve, a casing having a fuel outlet and embracing a section of said screw, and a cap adapted to cover a section of the screw and valve sleeve in a manner to prevent an undesired flow of fuel through the casing.

6. In a comminuted fuel feeder, the combination of a hopper bottom provided with a plurality of fuel outlets, a cut-off slide for each outlet, a valve casing secured to said bottom between each adjacent pair of outlets, a spacer beneath each outlet between said casings, a slidable valve sleeve in each casing having an open portion extending into and supported by said spacer and a tubular portion having a notched end within said casing, a fixed sleeve in said casing having an enlarged end receiving the notched end of said slidable sleeve, the upper part of said casing being enlarged around the enlarged end of said fixed sleeve, and means to actuate said slidable sleeve.

7. The combination in a comminuted fuel feeder, of a rotary feed screw, a casing inclosing a section of the screw, and an adjustable sleeve feed valve having the upper portion of its end protruding from the cas-

ing cut away to give a free flow of fuel to the screw.

8. The combination in a comminuted fuel feeder, of a rotary feed screw, a casing inclosing a section of the screw, an adjustable sleeve feed valve having an end protruding from the casing, and a bearing adapted to support said protruding end for the purpose of preventing cramping of the sleeve within the casing.

9. In a comminuted fuel feeder, the combination of a hopper having a plurality of rows of fuel outlets in its bottom, the outlets in each row being staggered relatively to those in the adjacent rows, a cut-off slide for each outlet, valve casings secured to the underside of said bottom between the adjacent outlets in each row and extending beneath the outlets, a feed screw journaled in said casings beneath each row of outlets, an independently operable fuel valve in each casing, and a common conduit communicating with all of said casings.

10. In a comminuted fuel feeder, the combination of a rotary feed screw, a casing inclosing a section of the same, and having a discharge outlet, a longitudinally slidable valve sleeve surrounding said screw in said casing, the end of said sleeve projecting outside said casing and being cut away at the top to receive the fuel, and a supporting member for said end.

11. The combination in a comminuted fuel feeder, of a plurality of valve casings having feed outlets formed therein, valves in said casings to govern the feed, a feed screw adapted to convey fuel to said valves, a multiported member adapted to support said casings, and means for stopping the flow of fuel through any section of said multiported member when desired.

12. In a comminuted fuel feeder, the combination of a rotary feed screw, a casing inclosing a section of the same and having a discharge outlet, a longitudinally slidable valve sleeve surrounding said screw in said casing, the inner end of said sleeve having V-shaped notches cut therein and the outer end projecting outside said casing and being cut away at the top to receive the fuel, a sleeve fixed in said casing with its inner end surrounding the notched end of the valve sleeve, a bearing member, open at its top, surrounding and supporting said projecting end of the valve sleeve, and means to reciprocate the latter.

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Witnesses:

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