No. 666,257. Patented Jan. 22, 1901.

E. R. BESEMFELDER.

PROCESS OF MAKING ILLUMINATING GAS.

(Application filed Sept. 29, 1899.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1.

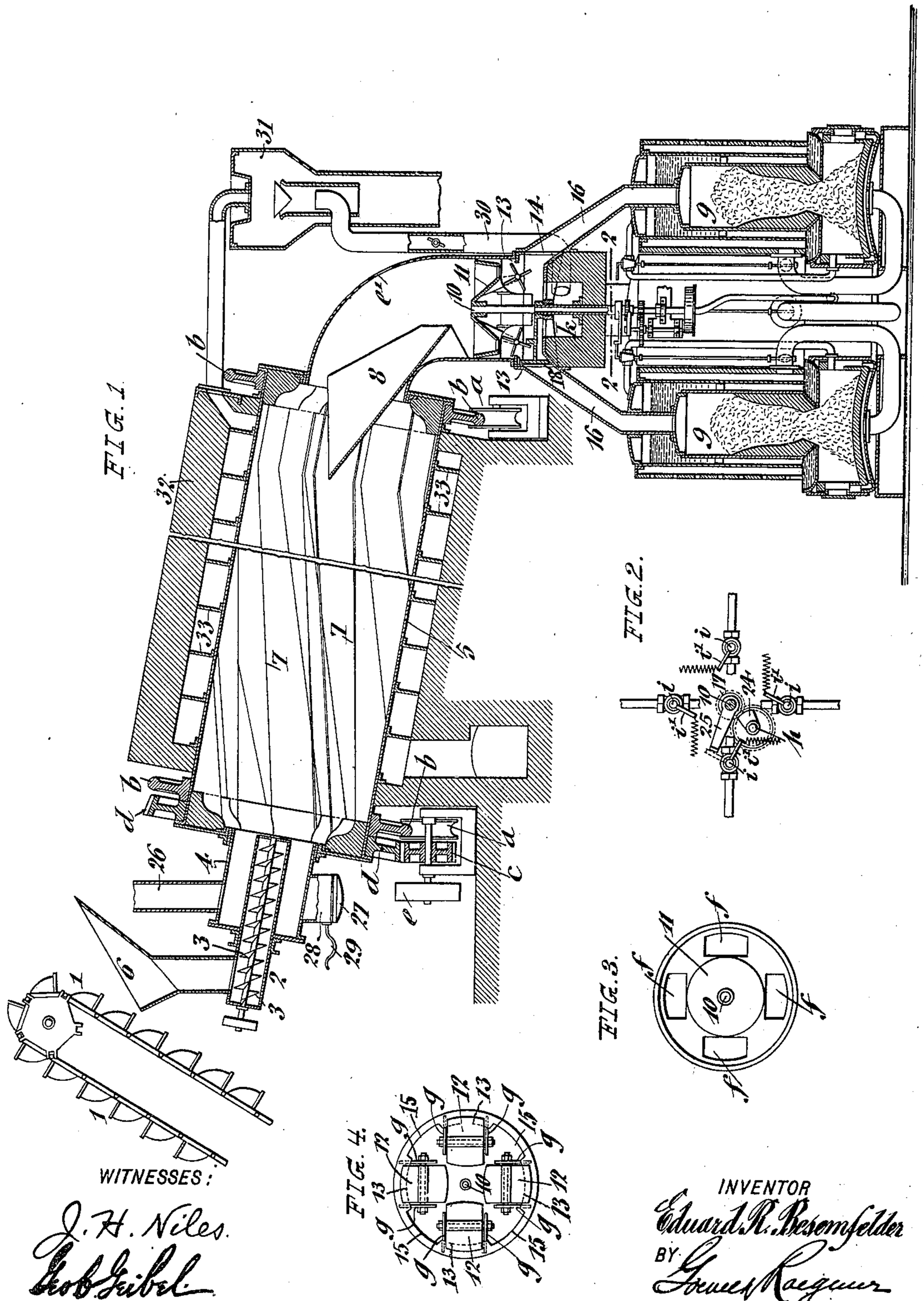


FIG. 2.

FIG. 3.

FIG. 4.

WITNESSES:

J. H. Niles.

Geo. Gribel.

INVENTOR

Edward R. Besemfelder

BY Howson & Sayward

ATTORNEYS

No. 666,257. Patented Jan. 22, 1901.

E. R. BESEMFELDER.

PROCESS OF MAKING ILLUMINATING GAS.

(Application filed Sept. 29, 1899.)

(No Model.) 2 Sheets—Sheet 2.

FIG. 5.

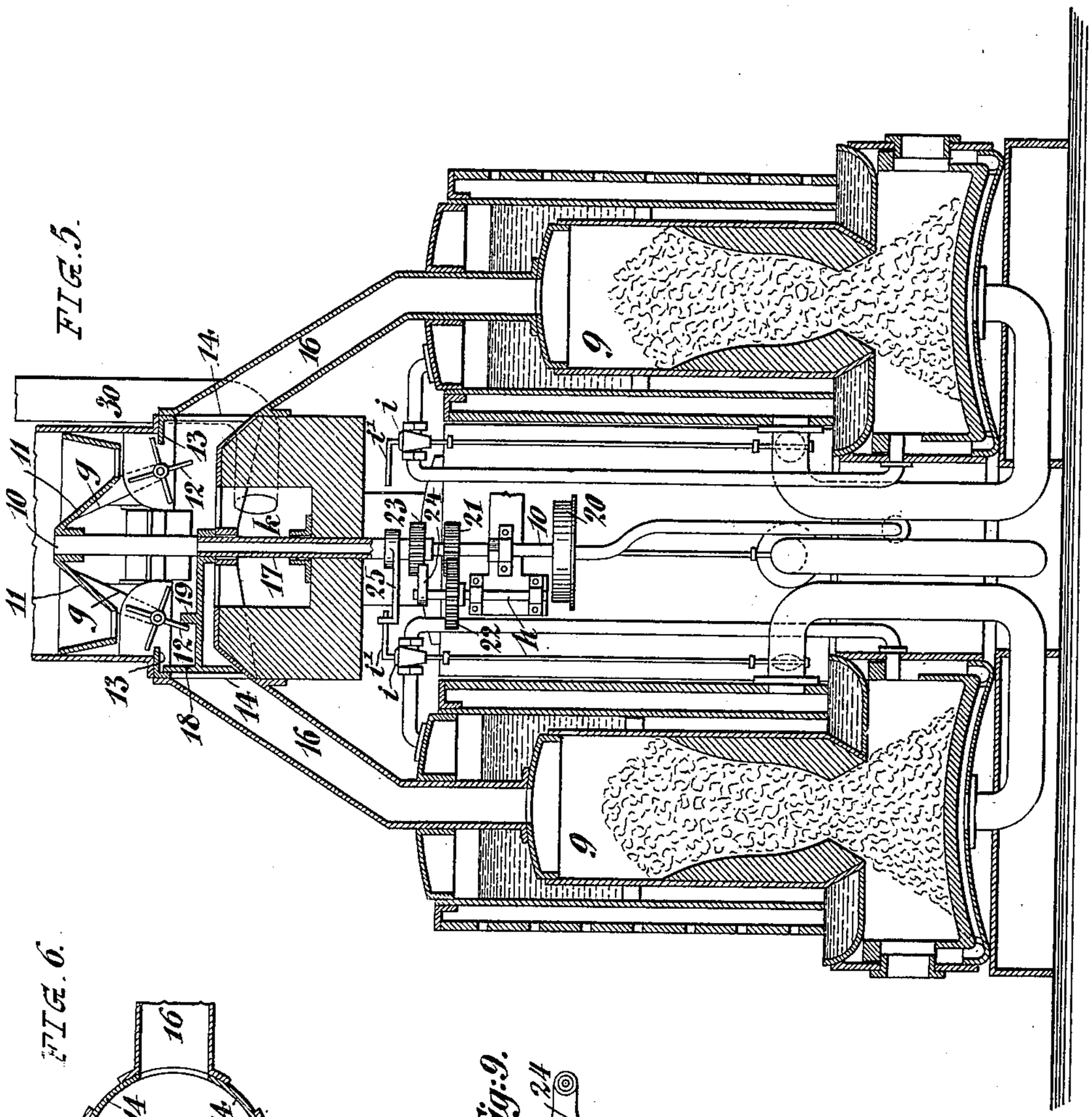


FIG. 6.

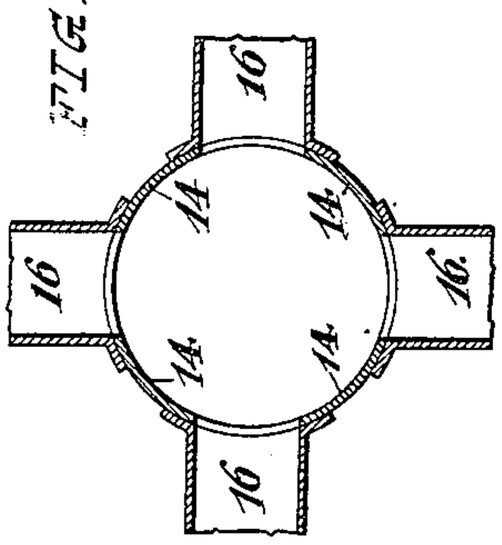


Fig. 9.

FIG. 7.

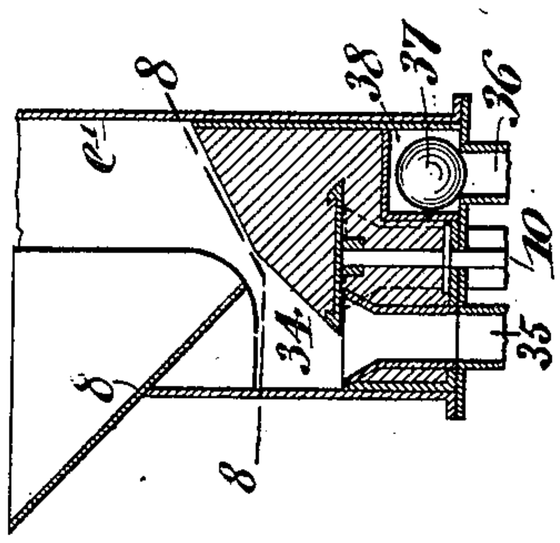
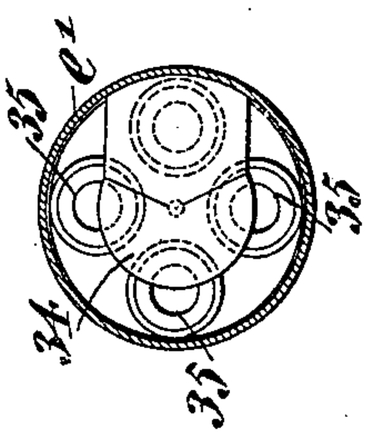


FIG. 8.



WITNESSES:

J. H. Niles.

Geo. B. Gribel.

INVENTOR

Eduard R. Besemfelder

BY Lemuel Legrand

ATTORNEYS

UNITED STATES PATENT OFFICE.

EDUARD R. BESEMFELDER, OF CHARLOTTENBURG, GERMANY.

PROCESS OF MAKING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 666,257, dated January 22, 1901.

Application filed September 29, 1899. Serial No. 732,080. (No specimens.)

To all whom it may concern:

Be it known that I, EDUARD R. BESEMFELDER, a citizen of the Empire of Germany, residing at Charlottenburg, Germany, have invented certain new and useful Improvements in Processes of Manufacturing Illuminating-Gas, of which the following is a specification.

In the processes of producing illuminating-gas heretofore in common use the coal or other carbonaceous material used is subjected to dry distillation in retorts that are heated from below. When the gas has been separated from the coal, the coke remaining in the retorts is drawn off and can be used as fuel after it has been cooled off.

This invention relates to improvements in processes in manufacturing illuminating-gas from carbonaceous material; and the object of the invention is to provide a process of this kind by which a good quality of gas is economically produced. For this purpose the invention consists in subjecting a body of carbonaceous material to dry distillation for producing coal-gas, continuously overturning said material while undergoing distillation, continuously conducting a stream of heated water-gas in contact with said overturning material, and conducting off for use the mixture of coal-gas and water-gas thereby produced.

The invention consists, further, in a process of the kind stated, with the additional step of utilizing the heat of the glowing coke resulting from the carbonaceous material for generating water-gas and keeping up the dry distillation.

My improved process may be carried out to advantage in the apparatus shown in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal section of the apparatus. Figs. 2, 3, and 4 are detail horizontal top views, on a larger scale, of portions of the apparatus, Fig. 2 being partly in horizontal section on line 2 2, Fig. 1. Fig. 5 is a vertical section through the water-gas generators and connected mechanism, drawn on a larger scale than in Fig. 1 to more clearly show the valve-gear of the generators. Fig. 6 is an enlarged view of a part of the apparatus by which the connection of the water-gas generators with the retort is made; and Figs. 7 and 8 illustrate a modified construction of apparatus for distributing the glowing coke to the water-gas generators, Fig. 8 being a section on line 8 8, Fig. 7. Fig. 9 is a top view of a portion of the distributing mechanism shown in Figs. 1 and 5.

Similar characters of reference indicate corresponding parts in the various figures.

Referring to the drawings, 1 represents a bucket elevator by which the coal which is to be used for the production of illuminating-gas is delivered into a hopper 6, which is arranged on the charging-neck 2 of the inclined retort 5. In the charging-neck is arranged a screw conveyer 3, the shaft of which passes through suitable stuffing-boxes to the outside and receives rotary motion by a suitable belt-and-pulley transmission. The charging-neck 2 is connected with the stationary front part 4 of the retort. The retort 5 is arranged, preferably, in inclined position and supported by means of grooved pulleys *a*, which engage circumferential rails *b* of the retort. Rotary motion is imparted to the retort 5 through gear-wheel transmission *c d* from a belt passing over pulley *e*. The forward motion of the coal in the retort 5 is produced by means of gutter-shaped conducting-ribs 7, which are arranged on the interior of the retort at a suitable inclination to the axis of the same. The speed of rotation of the retort 5 and the movement of the coal in the same are so timed that the coal leaves the retort in a condition similar to that of the coke in the ordinary process of making illuminating-gas. The glowing coal, which has been subjected to the destructive distillation, is conducted from the retort 5 through a chute 8 into the tubular neck *e'* of an axial distributer, which is located above a series of four water-gas generators 9, three of which are connected at any one time with the distributer, while the fourth is cut off from the same so as to permit the heating and conducting off of the gas generated therein.

In Figs. 2, 3, 4, and 6 are illustrated details of the distributer shown in Figs. 1 and 5. It consists of a vertical shaft 10, which is supported in suitable step and neck bearings and rotated by suitable power transmission. On the shaft 10 is mounted a distributing-cone 11, provided with four openings *f*, below which are rotatably supported between hangers *g*

paddle-wheels, which receive the glowing coke supplied to the cone. The blades 12 of the wheels are guided on and supported by segmental projections of the ring 14 when opposite said projections. As soon as by the rotation of the cone 11 the paddle-wheels are brought opposite the portions 15 between the projections 13 the wheels are turned by the weight of the material upon their outer blades and the material is dropped into the chutes 16, leading to the generators 9. For shutting off that generator which is actively generating gas from the distributer, so as to prevent the deterioration of the water-gas by means of nitrogen and carbonic acid and for preventing the supplying of additional material into the same a mechanism is employed which consists of a slide 18, mounted on a rotary sleeve 17 on shaft 10. The slide 18 is of segmental shape and carries a stop 19 on its upper side, so that when the slide is moved opposite a wheel rotation of the same cannot take place because of the abutting of one of its blades against the stop 19, as shown in Figs. 1 and 5. As soon as the generation of the gas in the closed-off generator is completed the slide 18 is automatically turned to an angle of ninety degrees, so that it will close up the chute 16 of the next gas-chamber. This shifting of the slide 18 is accomplished by the rotation of the shaft 10, on which is mounted a driving-pulley 20. A pinion 21 on the shaft 10 is in mesh with a gear 22 upon the counter-shaft *h*, which carries a segment 24, which engages at each rotation a gear 23 upon the sleeve 17, thereby rotating the same at intervals and moving the slide from chute to chute. Upon the intermittently-rotated sleeve 17 is a thumb-piece 25, which serves to open the steam-supply for each generator at the proper time. The relative positions of the segment 24 and thumb-piece 25 are shown in Fig. 2. The steam-supply cocks *i* are provided with spring-actuated arms *i'*, so that as soon as the thumb-piece 25 has passed the same they are returned automatically into their former closed position.

The generators 9 serve for producing the water-gas. Means are provided for supplying to the generators compressed air and steam, which latter is superheated in the generator itself by conducting the steam through tubes that are arranged in the iron protecting-walls of the generator, so that it is supplied to the interior of the generator in a superheated state. The steam-nozzles draw from a reservoir connected with the generators tar, petroleum residues, or other suitable carbureting materials and supply them in an atomized condition to the glowing coke in the generator. The water-gas generators may be of any suitable construction to carry out these functions. Those illustrated are generators well known in Europe and indorsed by the European Water-Gas Association, and it is therefore not necessary to go into a detailed description of the same. The thus carbureted water-gas passes from the generators through the glowing coke that is supplied from the distributer to the interior of the retort and volatilizes by its high temperature the carbon particles still contained in the coke, the mixed gas so formed being conducted through the retort 5 and the stationary head portion 4 of the same into a vertical pipe 26, through which it is conducted to the purifiers, which are of the ordinary construction usually used in the manufacture of illuminating-gas. Below the upright tube 26 is arranged a tar-collector 28, provided with a bottom 27, and from which the tar is conducted off through a siphon 29. The retort 5 is heated by the waste gases obtained from those generators which are not engaged in actively generating water-gas. These gases are free of oxygen and are conducted from the chamber *k* below the distributer through pipe 30 into a dust-collector 31, the upper end of which is connected with a helically-arranged flue, arranged in a cylinder 32 that encircles the retort 5. The spiral plates 33 may be arranged on the retort or on the surrounding cylinder 32 and serve for the purpose of compelling the gas to return in a helical course around the retort, so as to properly utilize the heat of the same.

In Figs. 7 and 8 is shown a modified construction of the distributer. In this case the glowing coke is conducted from the chute 8 onto a conically-shaped incline 34, and from the same into three open chutes 35. The cone 35 is rotatable and turned around its axis by the shaft 10. The chute 36 of the fourth generator, in which at the time water-gas is generated, is closed by a ball-valve 37, located in a pocket 38 of the cone. By the rotation of the cone the ball 37 is lifted from its seat over the chute of one generator to the chute of the next.

For the purpose of preventing the gases of high temperature which are conducted from the generator to the distributer and into the other parts of the apparatus from destroying the different parts with which they come in contact, it is advisable to protect the same with a fireproof jacket wherever the same can be applied. The apparatus shown is but one form adapted for carrying out the process, and any other suitable apparatus can be used.

As compared with processes at present in use my improved process of manufacturing illuminating-gas has the advantage that by the continuous rotation of the retort and working of the distributer a continuous process is obtained, while likewise a considerable saving in fuel, which was heretofore used in firing the retorts from below, is effected. The heat of the glowing coke is utilized and a much greater yield of gas as compared with the best present practice is obtained, as my process yields per ton of coal about fifteen hundred cubic meters of mixed gases of over three thousand heat units per cubic meter, as against twelve hundred per cubic meter heretofore obtained. By the continuous overturning of the carbona-

ceous material while giving off coal-gas the distillation is accelerated, and the complete mixture of the coal-gas with the passing water-gas produced, so that the illuminating-gas obtained is of excellent quality.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The herein-described continuous process of making illuminating-gas, which consists in subjecting a body of carbonaceous material to dry distillation for producing coal-gas, continuously overturning said material while undergoing distillation, continuously conducting a stream of heated water-gas in contact with said overturning material, and conducting off for use the mixture of coal-gas and water-gas thereby produced, substantially as set forth.

2. The herein-described continuous process of making illuminating-gas, which consists in subjecting a body of carbonaceous material to dry distillation for producing coal-gas, continuously overturning said material while undergoing distillation, continuously conducting a stream of heated water-gas in contact with the overturning material, conducting off the mixture of coal-gas and water-gas thereby produced, and continuously utilizing the heat of the glowing coke resulting from the carbonaceous material for generating water-gas and keeping up the dry distillation, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

EDUARD R. BESEMFELDER.

Witnesses:

FRANZ SCHWEGTERLEY,

LUDWIG WENGHOFFER.