

Feb. 6, 1923.

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SEPARATOR FOR GASEOUS FLUIDS.
FILED NOV. 25, 1921.

1,444,512.

2 SHEETS—SHEET 1.

FIG. 1.

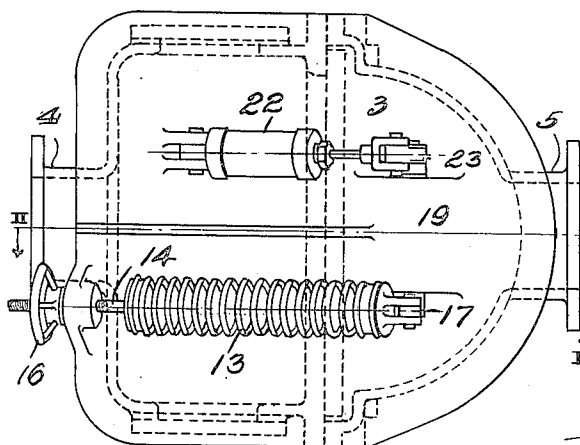


FIG. 2.

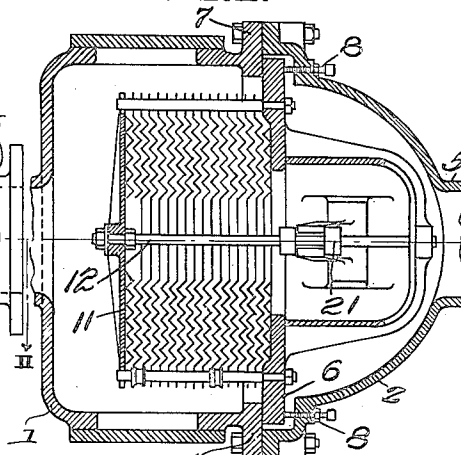


FIG. 3.

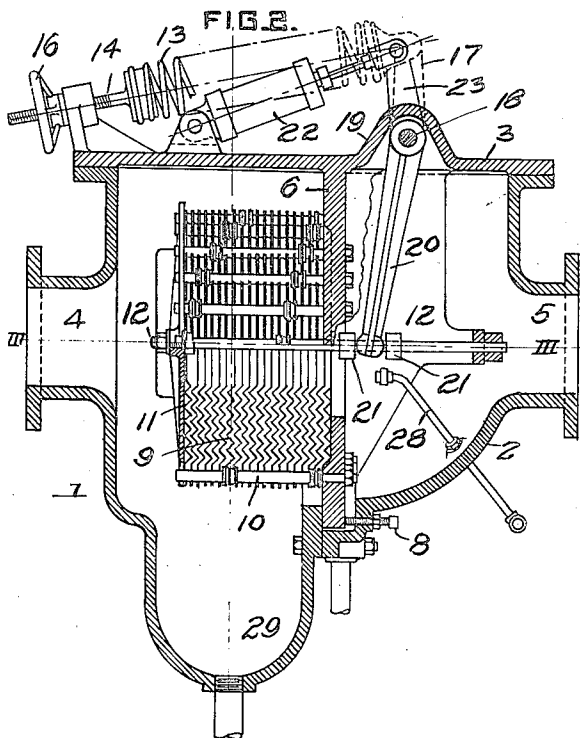
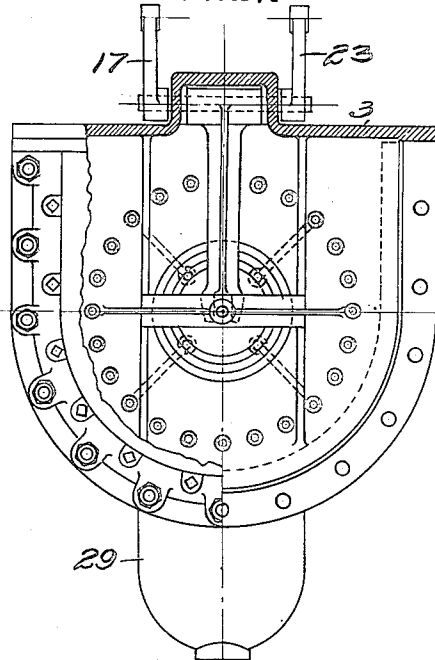


FIG. 4.



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2 SHEETS—SHEET 2.

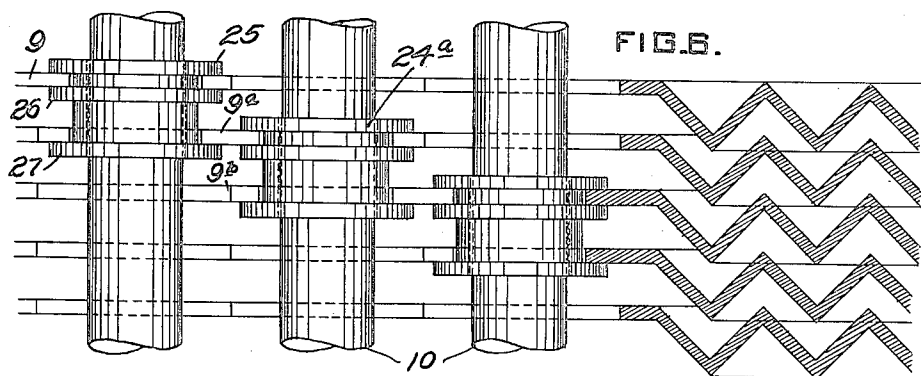
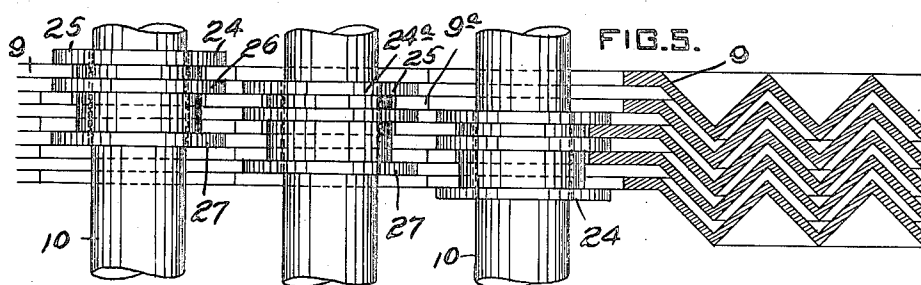
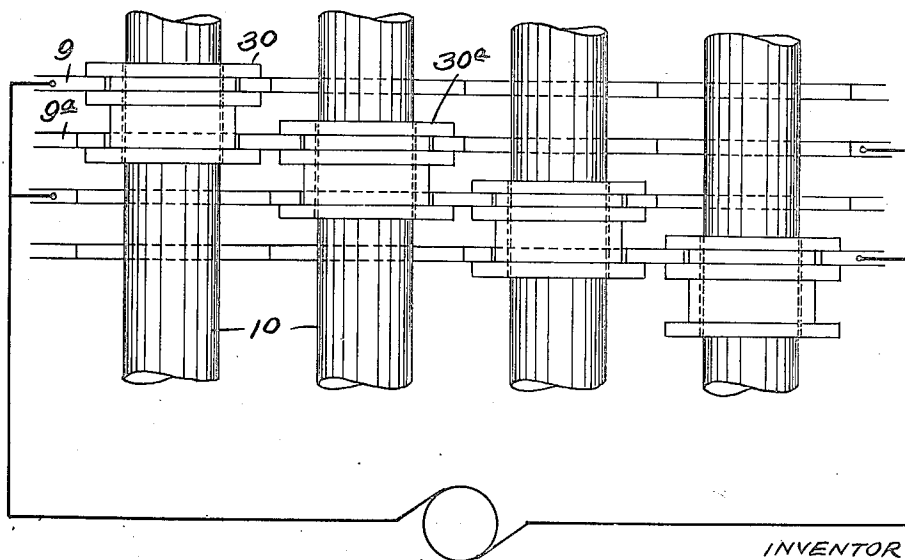


FIG. 7.



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UNITED STATES PATENT OFFICE.

OLIVER P. LUETSCHER, OF PERU, ILLINOIS.

SEPARATOR FOR GASEOUS FLUIDS.

Application filed November 25, 1921. Serial No. 517,807.

To all whom it may concern:

Be it known that I, OLIVER P. LUETSCHER, residing at Peru, in the county of La Salle and State of Illinois, a citizen of the United States, have invented or discovered certain new and useful Improvements in Separators for Gaseous Fluids, of which improvements the following is a specification.

The invention described herein relates to certain improvements in apparatus for separating entrained liquids from gases or vapors the improvement being especially applicable for separating tar from fuel gases.

The invention has for its object the provision of means whereby the area of the passages or spaces between adjacent liquid collecting surfaces may be automatically adjusted so as to maintain uniform pressure drop between the inlet and outlet and consequently an approximately uniform velocity of flow of vapor through the separator regardless of variations in the supply of gas or vapor between predetermined minimum and maximum. The invention is herein-
after more fully described and claimed.

In the accompanying drawings forming a part of this specification, Fig. 1 is a top plan view of a separator embodying the improvements claimed herein; Fig. 2 is a sectional elevation on a plane indicated by the line II—II, Fig. 1; Fig. 3 is a horizontal section on a plane indicated by the line III—III, Fig. 2; Fig. 4 is an end elevation, a portion of the shell being broken away; Figs. 5 and 6 are details showing portions of the separating plates and illustrating the manner in which they are supported, the plates being shown as in closed position in Fig. 5 and in open position in Fig. 6; Fig. 7 is a diagrammatic view illustrating the manner of connecting the plates to an electric generator.

In the practice of the invention the case or shell is preferably formed in two sections 1 and 2, secured together in any suitable manner and with a cap or top 3 bolted to the sections, the sections 1 and 2 are provided respectively with inlet and outlet nozzles 4 and 5. The shell is divided into two compartments or chambers by a partition 6 formed integral with the cap 3 and held in gas tight contact with a flange 7 by means of set screws 8. This partition is provided with an opening for the flow of gas from the inlet and to the outlet compartment and to the rear side of the partition are secured annular

plates 9 forming the separating surfaces. These plates are formed with circular corrugations concentric with the axes of the plates, said plates being supported by posts 10 secured at one end to the partition. Gas is prevented from flowing directly through the openings in the plates by a disc 11 which is notched peripherally for the reception of the posts 10, and is attached to a rod 12. Any suitable means may be employed for holding the plates yieldingly in proper relation to each other to ensure the maintenance of the desired drop of pressure between the inlet and outlet without regard to variations between maximum and minimum in the quantity of gas flowing to the separator. A suitable construction for holding the plates in yielding relation consists of a spring 13 having one end connected to a threaded rod 14 passing through an abutment and a nut 16 bearing against the abutment. The opposite end of the spring is connected to an arm 17 keyed on a shaft 18, the ends of which project through the sides of the hollow boss 19 formed on the cover 3. An arm 20 has one end keyed to the portion of the shaft 18 within the hollow boss while the opposite end of the arm is forked and the prongs of the fork project between collars 21 on the rod 12 which as before stated, is connected to the disc 11. It is preferred that a dash pot 22 should have its piston connected to an arm 23 on the shaft 18 in order to prevent a chattering of the plates in case of rapid changes in the supply of gas to the separator.

Provision is made for preventing adjacent plates from approaching one another nearer than a predetermined minimum and also from being separated a distance greater than a predetermined maximum, but permitting relative movements of the plates between those limits. In the construction shown, spools 24 are slidably mounted on the posts 10 and are provided with collars 25, 26, and 27, the collars 25 and 26 being spaced a distance apart a little greater than the thickness of the plates and made of a thickness substantially equal to the minimum distance desired between adjacent plates. The other collar 27 is spaced a distance apart from the collar 26 substantially equal to the maximum distance desired between adjacent plates. By reference to Figs. 5 and 6, it will be seen that the plate 9 projects between the collars 25 and 26 of a spool 24

and hence the spool will be moved by said plate as hereinafter described, but the edge of the adjacent plate 9^a projects between collars 26 and 27, and hence is movable with reference to plate 9 any portion of the distance between the collars 26 and 27. The plate 9^a projects between the collars 25 and 26 of a spool 24^a which may be on an adjacent post 10 and spools on posts further along the series of posts, so that these spools will be moved along said posts. A plate 9^b adjacent to plate 9^a extends between the collars 26 and 27 of spool 24^a and hence will have a limited movement relative to plate 24^a. By the pull of the spring on the disc 11, the plates are drawn towards each, but held spaced apart by the collars 25 and 26, as shown in Fig. 5. The corrugated plates are spaced such a distance apart that the total areas of the passages between the plates will be such that with a given supply of gas there will be a predetermined drop of pressure between the inlet and the outlet chambers, such drop being dependent upon the desired rate of flow of gases between the plates. The tension of the spring having been adjusted so that with a given supply of gas there will be such a drop of pressure as to ensure the desired rate of flow between the plates, the plates will maintain their relative positions until there is a change in the supply or the spaces between the plates become clogged with tar. When from either cause, there is a change in pressure in the gases, there will be an automatic shifting of some of all of the plates, thereby so varying the total areas of the passages between the plates as to restore the desired drop of pressure between the inlet and outlet chambers. As for example, if there should be an increase in the supply of gas in the passages between the plates and they become clogged with tar, there will be a temporary increase of pressure in the inlet chamber and between the plates thereby forcing the plates apart against the tension of the spring and permitting a corresponding increase to normal in the rate of flow between the plates. If there should be a decrease in the supply of gas, the spring will cause the plates to move towards each other reducing the areas of the passages between the plates.

Water is injected into the spaces between the plates by means of spraying nozzles 28 on the ends of pipes projecting into the central passage formed by the annular plates. As will be readily understood, the minimum supply or capacity, and by that is meant the smallest quantity of gas that will flow with the desired velocity between the plates, is determined with a given number of plates by the total areas of the passages, when the plates are separated distances apart equal to the thicknesses of the collars 25 and 26, but the capacity of the improved separator can

be readily increased by merely increasing the number of plates. As the tar may adhere to the surfaces of the plates, and in that case an undesired increase in the drop of pressure even when the plates are separated the maximum distance would occur, the pipes carrying the nozzles 28 may be connected to a steam supply to so heat the plates that the tar will run off and drop into the tar collecting chamber 29.

If it should be desired to utilize the agglomerating action of the electric field on the entrained liquid, spools 30 similar in construction to the spools 24, but formed of a suitable insulating material may be used and the plates connected as shown in Fig. 7 to the collecting rings of an alternating generator.

I claim herein as my invention:

1. A separator for gases having in combination a plurality of independently movable spaced members having adjacent surfaces corrugated to form tortuous passages for the gas, the corrugations of one member being complementary to those on the adjacent members, and means operative by and in accordance with changes in the gas supply for changing the cross sectional area of the passages between the members.
2. A separator for gases having in combination a plurality of independently movable spaced plates having adjacent faces corrugated to form tortuous passages for the gas, the corrugations on one plate being complementary to those on the adjacent plate and means for changing the cross sectional area of the passage between the plates.
3. A separator for gases having in combination a plurality of independently movable spaced plates having adjacent faces corrugated to form tortuous passages for the gas, the corrugations on one plate being complementary to those on the adjacent plate and means for changing the distance between adjacent plates.
4. A separator for gases having in combination a plurality of annular spaced plates having adjacent faces corrugated to form tortuous passages for the gas said plates being independently movable, the corrugations on one plate being complementary to those on the adjacent plates and means for changing the distance between adjacent plates.
5. A separator for gases having in combination a plurality of independently movable spaced plates having adjacent faces corrugated to form tortuous passages for the gas, the corrugations on one plate being complementary to those on the adjacent plate and means operative in changes in the supply of gas for changing the distance between adjacent plates.
6. A separator for gases having in combination a plurality of independently movable spaced plates having adjacent faces corru-

gated to form tortuous passages for the gas, the corrugations on one plate being complementary to those on the adjacent plate and means for yieldingly holding the plates as
5 against separation.

7. A gas separating device having in combination independently movable members having corrugated surfaces and spaced apart to form tortuous passages for the gas, means
10 for supporting the plates in such spaced relation as to establish a predetermined drop in pressure between the points of entrance and exit of the gas, and means operative by
15 and in accordance with changes in the supply of gas for so changing the spaced relation of the plates as to maintain the normal drop of pressure.

8. In a gas separator the combination of a plurality of independently movable annular
20 plates having adjacent faces corrugated, means for movably supporting the plates in

spaced relation one to the other and yielding means for moving the plates towards each other.

9. In a gas separator the combination of 25 a shell having inlet and outlet nozzles, a partition having an opening therethrough arranged intermediate the inlet and outlet nozzles, a plurality of posts arranged around the opening through the partition, a plural- 30 ity of annular corrugated plates, spools movably mounted on the posts and provided with two collars overlapping opposite sides of one plate so as to move therewith and with a third collar adapted to limit the movement 35 of an adjacent plate, and yielding means for holding the plates as against movement one from the other.

In testimony whereof, I have hereunto set my hand.

OLIVER P. LUETSCHER.