

UNITED STATES PATENT OFFICE.

JOHN F. BENNETT, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN APPARATUS FOR CONDENSING COAL-OIL.

Specification forming part of Letters Patent No. 28,341, dated May 22, 1860.

To all whom it may concern:

Be it known that I, JOHN F. BENNETT, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in the Apparatus for Condensing Oils from Coal and other Oleiferous Substances; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawing, forming part of this specification, which is a perspective view of the apparatus employed by me in my process, the construction and arrangement of which form the subject-matter of another application for a patent.

My improvement consists in the use of an apparatus, such as is hereinafter described, when combined with a coal-oil retort, for condensing and separating the oleaginous vapors as they pass from the retort in which they are generated, by which, instead of allowing all the vapor to condense into a crude oil and then subjecting this crude oil to a refining process or processes to separate the various grades of oils from each other, or to separate the other substances—such as benzole, paraffine, &c.—from the oils, I subject the vapor itself, as it arises from the retort or generator, to a gradual and varying process of condensation, by means of which the various kinds of oils are separated from each other, and the other products of distillation separated from the oils without a subsequent refining process, thus, in effect, combining in one the process of condensing and separating the products of distillation. It has been attempted to accomplish this separation of the different kinds of oils before the condensation of the oleaginous vapor by drawing off the vapor at different parts of the retort or generator, or at different stages in the process of distillation, and collecting them in distinct receptacles and condensing them separately. This, however, only partially and very imperfectly accomplishes the result aimed at.

In order to enable others skilled in the art to make and use my improvement, I will proceed to describe the construction of the apparatus employed and the mode of using the same.

In the drawing, *a* is the main or pipe through which the oleaginous vapor passes as it leaves the retort or generator. This pipe should in-

cline slightly downward toward the prime condenser A, so that any condensed matter may flow into it, rather than return to the retort. The pipe *a* opens downward into the prime condenser A, which is a cylindrical metallic vessel placed near to the generator or retort. At one end of the prime condenser is a large goose-neck, *b*, which serves as the discharge-pipe for the pitchy matter and heavy oils, which are there collected. Into this prime conductor a stream of steam at 212° Fahrenheit is introduced by a steam-pipe, *c*, from a boiler conveniently situated for that purpose. Adjoining the prime condenser is a second condenser, B, similar to A, but immersed in a trough of water, C. A pipe, *d*, conducts the oleaginous vapor not condensed in the prime condenser into the second condenser, B, which is furnished with a goose-neck, *e*, of smaller caliber than the goose-neck of the prime condenser, and through which the oils condensed in the second condenser are discharged into the receptacle placed to receive them. The water in the trough C surrounding the second condenser is supplied from the adjoining trough of the third condenser by the spout *f*, and overflows through the spout *g*, which is situated at such a height as to keep the condenser B covered with water. The third condenser, D, similarly constructed to the condenser B, is also immersed in a trough of water, E, and is fastened with a goose-neck, *h*, similar to *e*, which discharges the condensed liquid products of the third condenser. A pipe, *i*, connects the second condenser, B, with the third condenser, D, and allows the oleaginous vapor uncondensed in the second condenser to pass into the third condenser.

At the end of the third condenser, D, opposite to that at which the pipe *i* enters it, there is a smaller pipe, *k*, through which the highly-volatile vapor yet remaining uncondensed passes to the worm *w*, which is coiled in the refrigerating-cistern F, which is supplied with cold water through the conduit *l*. The water in the cistern F overflows through the spout *m* into the trough E of the third condenser, D. The worm *w* terminates in the air-pipe *p*, which is connected with an air-pump or reverse-action double-blowing cylinder, H. The goose-neck *n* is attached to and opens into the lowest point of the pipe *p*, at the end of the worm

w, and through it all the remaining products of distillation (being chiefly benzole and naphtha) are discharged into a suitable receptacle.

The air-pump is designed to create a partial vacuum through the condensers, and operates with a force of from two to five pounds per square foot.

I will now proceed to describe more particularly my improved process. The oleaginous vapor, which is generated in the retort by the distillation of coal, shale, or other bituminous or oleiferous substances, passes through the pipe or main *A*, and is usually at a temperature of about 650° Fahrenheit. In passing through the pipe it is somewhat cooled, and any of the heaviest products which may be condensed in the main run in a fluid state into the prime condenser *B*, the passage of the oleaginous vapor from the retort and through the condensers being expedited and kept up by the action of the air-pump or blower, which serves the further purpose of preventing the escape of any vapor or gas through any crack or aperture which may exist in the apparatus, making the leak, if any, inward, and not outward. On entering the prime condenser the oleaginous vapor meets with a stream of steam from the pipe, which, being at 212° Fahrenheit, reduces the temperature of the heated oleaginous vapors in the prime condenser to about 350° Fahrenheit, at which point the heavy oils and pitchy matter are deposited, allowing the oleaginous vapor, then freed of its heaviest and most easily-condensable particles, to pass off into the second condenser, the heavy oils and pitchy matter deposited in the prime condenser flowing off through the goose-neck *b*. The oleaginous vapor, at about 350° Fahrenheit, passes through the pipe *d* into the second condenser, which is surrounded with water heated to about 200° Fahrenheit, (by the vapor in the second condenser having been before partially heated in the trough *E*, from which it flows, as before stated.) In this second condenser the temperature of the oleaginous vapor is reduced about 150°, and is thereby made to deposit the paraffine-oils, which name I use to designate an oil heavier than the burning-oils resembling the "binnacle oil," and containing paraffine. The oleaginous vapor, now reduced to about 200° Fahrenheit, passes through the pipe *i* into the third condenser, which is surrounded with cold water which runs from the

cistern *F*, and which keeps the temperature of the third condenser down to about 100° Fahrenheit. As the temperature of the oleaginous vapor is being reduced in this third condenser from 200° to 100° Fahrenheit it deposits the lighter kind of oil, called "burning-oil," which forms the largest product of the distillation. The remaining vapors which will not condense in the third condenser are drawn off through the pipe *k* into the worm *w* in the refrigerating-cistern *F*, where they are still further condensed, yielding the highly-volatile oils and naphtha and benzole, which have a peculiar and very strong smell. Then it will be seen that I am enabled to procure the different kinds of oils separate from each other, separating them during and by means of the process of condensation, thus saving a great deal of time and an expensive process, which is necessary where the liquid products of distillation are, as is usual in other processes, collected together in the first instance in one crude oil, requiring separation before it can be used for illuminating purposes.

In the use of the process hereinbefore described I do not desire to confine myself to the use of the precise apparatus hereinbefore described, as this may be modified to suit the convenience of the manufacturers, or the nature of the volatile products of distillation, the apparatus described being designed to furnish a convenient mode of carrying my improved process into practical operation.

What I claim as my invention, and desire to secure by Letters Patent, is—

Subjecting the volatile products of the distillation of coal (composed of a mixture of various substances in the form of vapor) directly as it passes from the retort or prime generator to gradually-diminishing degrees of heat in a succession of condensers, for the purpose of separating by one operation each of these several different substances from the other substances with which it is mixed when in the form of vapor, at the particular degree of temperature at which it assumes the liquid form as distinguished from the fluid or gaseous form, by means of an apparatus such as described when combined with a coil-oil retort.

JOHN F. BENNETT.

Witnesses:

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MARTIN G. CUSHING.