the uptake. In Fig. 5 is represented the application of a similar arrangement of tubes and balls to the ordinary cylindrical boiler. The construction is quite obvious from the engraving, so that no especial explanation is deemed necessary.

Referring once more to Fig. 1, in that illustration is shown both the improved boiler applied to a locomotive and also a peculiar construction of the latter machine. The form of the generator, it is clearly evident, does not comprise the large cylinder, which forms a part of the ordinary boiler, and the larger portion of the body of the motor; and consequently it is proposed to convert the same into a simple tank completely separated from the boiler by the double partition, A. The object of this is to render the locomotive adjustable in the matter of weight, by filling this receptacle with water or heavy solid material. To illustrate, the inventor considers it unnecessary, and in fact a waste of iron, to run a thirty-five tun locomotive over a road of varying grades, where its full tractile power is needed only on heavy up slopes, while a fifteen tun engine would do all the necessary pulling on levels or down inclines. With a light and compact boiler, with a tank as represented in the locomotive in our engraving, the total weight of the machine need not exceed fifteen tuns; but by filling with water or other material, the same may be quickly increased to any desired extent up to the limit, say of thirty-five tuns. At C, a small funnel is erected which is designed to receive the spout from water stations; and at D a door is placed, which may be used for gaining access to the interior of the tank, or for more conveniently throwing in weights. One or both of these apertures may be employed at will; and by the materials added, the weight of the locomotive may be quickly augmented or lessened in proportion to the load it is to draw and other circumstances. In case of a line having many ascending grades, rendering it necessary to change the weight of the engine quickly, while in motion, it is proposed to place troughs between the rails at the bottom of the slope and let the water be taken up into the tank in the ordinary manner now in use on many roads for filling the tender. On arriving at the summit of the grade, this water is discharged, and the locomotive once more rendered light.

The various parts of the machine, as shown in Fig. 1, are of the usual description and require no explanation. B is the exhaust pipe, to which we have already referred as entering the uptake at J, Fig. 2.

The construction of the boiler and the peculiar arrangement of the locomotive are made the subjects of separate patents, and the credit of the inventions is due to Mr. Daniel T. Casement, of Painesville, Lake county, Ohio, who has patented them, through the Scientific American Patent Agency, in the United States, Canada, England, Australia, and most of the countries of Continental Europe. Letters for further information should be directed, for the next three months, to the patentee, at the Fifth Avenue Hotel, New York city.

Prizes offered by the Paris Society for the Encouragement of National Industry.

In addition to the grand annual medal of commerce, Chaptal prize, a prize of 2,000 francs in the class of cotton industries, the Society offers the following prizes for the year 1874:

	Frs.
For a small motor for home industries	2,000
Combing cotton and short fibers	1,000
Dressing of millstones (Ferté-sous-Jouarre prize)	5,000
Practical and economic production of oxygen	2,000
Utilization of waste matters in factories	1,000
Transformation yielding a natural useful product, such as quinine, sugar, etc	4,000
Artificial production of fatty acids and wax	4,000
Disinfection of the residue of the purification of gas	1,000
Conservation of food in the fresh state	3,000
Apparatus for small workshops producing high temperatures	1,000
Cultivation of grass and trees in mountains	2,000
" " " " (second prize)	500
Irrigation	3,000
" (second prize)	2,000
Production of healthy seed from French silkworms	500
Reclamation of land and embankments	2,000
A drill for sowing manure in powder	1,000
Study of the progression of the phylloxera from one vine to another	2,000
Fabrication of good photographic paper	2,000

Details of these and other prizes to be obtained on application to the secretary, No. 17 Rue de l'Abbaye, Paris.

Bronze Casting under Artificial Pressure.

A French officer, Colonel Lavroff, has given his attention to the casting of bronze guns under a more efficient pressure than has hitherto been employed—a parallel operation with that of Sir Joseph Whitworth in the case of iron and steel.

A cast iron platform is laid on foundation walls; and upon the former rests, first, the ground plate of the mold, and secondly the mold itself, which is of great strength. This mold is surrounded by a heavy cast iron jacket, which is bolted to the platform; springs are arranged to protect the bolts and the other part of the apparatus against the effects of the dilatation of the mold after the running. The cover is furnished with a cylinder formed of clay or other bad conductor of heat, and on this is placed a metallic piston with a pocket or receptacle. The piston and pocket form one solid piece, which is supported in its position at the required level by iron bands. The opening for the metal as well as the pocket is lined with fire clay.

The upper part of the metallic mold and the inferior surface of the cover are also lined with fire clay, in order to retard as much as possible the cooling of the upper part of the casting. The air and gases escape from the mold by means of several conical vents. The apparatus producing the pressure consists of a frame formed of two cast iron cross pieces connected together by means of bolts. This frame, while embracing the mold, is at the same time freely suspended to the chain of a crane by means of an iron ring. The frame is furnished on its under side with a piece of metal, which serves to close the opening through which the metal is run, and to transfer the pressure to the piston. This pressure is produced by means of an hydraulic press fixed to the lower part of the platform, its piston in its descent drawing down the frame.

The conditions laid down by Colonel Lavroff are as follows: (1) Each transversal section of the interior of the mold should be at least equal to any section above it. (2) The upper part of the casting ought to be preserved as much as possible from loss of heat, by means of a non-conducting lining within the mold. (3) Finally, the piston acting on the molten metal should present to it a non-conductor, and, moreover, should act upon the central portion of the liquid column and not over its whole surface.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 16 to January 19, 1874, inclusive.

CONDENSED MILK.—G. Conklin, New York city.

FILTER.—P. Huerne, San Francisco, Cal.

FOG SIGNAL.—G. C. Pattison, Baltimore, Md.

MAKING LAMPBLACK.—J. Rogers, New York city.

PIPE WRENCH.—J. Austin, New York city.

SHOE TIP.—A Pollok, Washington, D. C.

VENTILATING AND WARMING.—A. G. Myers, New York city.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

BASE BURNING STOVE PATENT.—HAILES & TREADWELL *vs.* VAN WORMER *et al.*

[Appeal from the Circuit Court of the United States for the Northern District of New York.—October Term, 1873.]

A new combination is patentable if it produces a new result, although all the elements were previously known and in use.

But the new results must be something additional to the results which were separately produced complete before by the different parts of the combination; a mere aggregation of those results is not such new result, and does not render a combination legitimate.

A grouping together of devices in which each one produces its customary effect unmodified by the rest, and no more, and in which no result follows the union which was not previously produced by some of the elements, is a mere aggregation, and not a legitimate and patentable combination.

No one can prevent others from using certain specified devices, either singly or together, because he was the first to use them together, unless he thereby produced a new and useful result which was due to the joint action of the constituent parts, and was not merely an aggregate of the effects which were produced by those parts when operating by themselves.

A claim to a combination which is defined to be "substantially as described" is thereby limited to the elements which are described in the specification as composing it.

Mr. Justice Strong delivered the opinion of the court:

The bill of the complainant is founded upon two patents, for alleged improvements in base burning stoves. Of these patents one is a reissue, dated February 3, 1863, and the other is an original, dated August 11, of the same year. The earliest asserts twelve claims, of which the first five only are charged to have been infringed by the defendants, and the second contains six claims, upon the first and second of which alone it is averred there has been any encroachment. The answer of the defendants denies both the novelty and the patentability of the inventions claimed, and it denies also the infringement charged in the bill.

The stove containing the improvements described in the patents held by the complainants, and that manufactured and sold by the defendants, belong alike to a class of stoves long known as "base burners" or self feeders, called such because they have a magazine or reservoir suspended above the fire pot, which may be filled with coal at its upper extremity, and which, when filled, is closed by a cover. The lower end of the reservoir or feeder is left open; and as the coal in the fire pot is consumed, that in the reservoir falls and supplies the place of that consumed, the combustion being only in the fire pot, and not in the reservoir. Many such stoves had been made, and they were well known years before either of the complainants' patents was granted, and it is not claimed that, merely as base burning stoves, they are within the monopoly of the patents. The inventions claimed are alleged improvements in the structure and arrangement of such stoves. They consist in what is described as a new combination of old and known devices, producing a new manufacture—namely, a stove uniting in itself all the advantages of a reservoir stove, and those of a revertible draft stove, which prevents the products of the combustion in the fire pot from passing up around and over the reservoir, thereby heating the fuel therein, so as to expel its gases, and cause their explosion as well as their escape into the apartments where the stove may be placed. All the devices of which the alleged combination is made are confessedly old. No claim is made for any one of them singly, as an independent invention.

It must be conceded that a new combination, if it produces new and useful results, is patentable, though all the constituents of the combination were well known and in common use before the combination was made. But the results must be a product of the combination, and not a mere aggregate of several results each the complete product of one of the combined elements. Combined results are not necessarily a novel result, nor are they an old result obtained in a new and improved manner. Merely bringing old devices into juxtaposition, and there allowing each to work out its own effect without the production of something novel, is not invention. No one by bringing together several old devices without producing a new and useful result, the joint product of the elements of the combination, and something more than an aggregate of old results, can acquire a right to prevent others from using the same devices, either singly or in other combinations, or, even if a new and useful result is obtained, can prevent others from using some of the devices, omitting others in combination.

If, now, we examine the patents held by the complainants, looking first at the objects sought to be obtained by the combinations for which the patents were granted, they are, as described in the specification, first, to prevent the passage of the products of combustion up, around, and over the top of the coal supply reservoir, so as to heat a surrounding jacket thereof; and, secondly, to heat a circulating or ascending body of air by means of radiated heat from the fire pot, and at the same time to heat the base of the stove by means of direct heat circulating through descending flues which lead into the ash pit, or around it, and to the smoke and draft flue. A third avowed object is to secure economy by retarding the fall of the coal into the fire pot from the supply reservoir, and by causing the flame to circulate outside of the contracted discharge of the reservoir, and around the upper edge of the fire pot, and thence to descend around or under the base of the stove in its passage to the smoke and draft flue. Such are the avowed objects of the combinations claimed to have been devised by the patentees, and their effects they assert to be husbanding the radiated heat, and using it for the purpose of warming the upper part of the stove and the room in which it is situated, as well as for heating air for warming rooms above, if desirable, and at the same time so confining the direct fire heat, and keeping it in contact with the base portion of the stove, as to insure warming it to a comfortable degree. A second effect claimed is relief of the incandescent coal from the weight of the body of superincumbent coal, thus preventing the compression of the burning coal in the fire pot, and securing for the flame free expansion, thus enabling it to act with greater heating effect upon the lower portion of the stove in its passage to the smoke and draft flue.

The combination employed to produce these effects consists of the following devices, among others:

1. A flaring fire pot supported by a base, the diameter of the pot being larger at the top than at the bottom.
2. A magazine or reservoir for supplying coal, located over the fire pot, and having its lower end contracted.
3. Revertible passages or flues outside of the pot for the conduct of the products of combustion downward to the base of the stove, and thence to a main draft flue leading thereout.
4. A direct draft for such stoves as are constructed with revertible flues, the direct draft being obtained by a flue passing out above the fire pot, and provided with a damper to be closed after the fuel has been ignited.
5. Openings in the case or exterior of the stove and the insertion of mica therein, for the purpose of illuminating the room in which the stove may be with the light of the burning fuel.

These devices, with others, are brought together, and claimed as a new combination, and several combinations of some of them are also claimed as inventions producing novel and useful results. What those other devices are we need not specify, for it is not shown that they are employed by the defendants.

The stove of the defendants does, however, contain all those mentioned, and contains them in combination. That each of them was an old device, well known, and in public use before the patents of the complainants were granted, is abundantly proved by the evidence submitted. A flaring fire pot, a supply reservoir with its lower extremity of smaller diameter than its upper, revertible flues, a place for flame expansion above the fire pot, the addition of a direct draft for use in igniting the fuel, provided with a damper, and the insertion of mica for illumination openings, were all found in stoves before Hailes and Treadwell claimed to have made their invention. It is true there is a peculiarity in the construction of the lower extremity of the complainants' supply reservoir. It is provided with a circular flange, extending outward and bending downward, so as to fit upon the upper rim of the fire pot, and thus form a closed combustion chamber. This, of course, cuts off communication with the space around the upper part of the reservoir, and confines the flame and other products of combustion within a circular combustion chamber thus formed: leaving no outlet for them except through ear passages into revertible flues. For this device, the peculiar structure of the reservoir, and the formation of the closed expansion chamber, there is no equivalent in the defendants' stove. There is no such closed chamber. The reservoir does not rest on the fire pot. It has no connection with it, or with the sides of the stove. Nor is there any obstacle interposed to the passage of the products of combustion up and around the reservoir when the flue for direct draft is open; and when that flue is closed, the flame is not detained over the burning coal, but the products of combustion pass directly across the edge of the fire pot, and descend along the sides thereof to the interior draft passage. Such an arrangement is not fitted to produce the effects sought and claimed for the complainants' stoves. On the contrary, it plainly excludes them.

There are other differences in the devices used both in the complainant's and the defendant's stoves, which we think are substantial, and not merely formal. The combination claimed by the complainants passes the products of combustion out of the chamber through perforations in the flange or through ears into flues leading downward, but wholly exterior to the fire pot, and not in contact with it. This arrangement makes it possible to introduce external air through perforations in the outer casing of the stove, and allow it, when heated by contact with the fire pot and the descending flues, to escape from the top. Accordingly the outer casing is perforated, and there is no closed magazine around the fire pot. But in the defendant's stove there is no such device, and no such effects are produced. There are no external downward flues separated from the fire pot. The whole space around the magazine and the fire pot is completely inclosed. There is but a single chamber around the reservoir, over the surface of the burning coal, and around the fire pot. Through this chamber the products of combustion pass, either through the direct draft flue, when that is in use, or to the base of the stove, and thence outward. This arrangement also excludes the possibility of an effect claimed for the Hailes and Treadwell invention. It admits of no space around the fire pot to which the external air can have access.

It is not, then, the combination of old devices which the defendants use that Hailes and Treadwell invented. It is not those old devices that produce the new results claimed. The complainant's combination is a different thing. It has a greater number of constituent elements. It consists in the employment of the devices used by the defendants, together with others they do not use, and the result of the entire combination is the production of a stove differing very materially from that of the defendants; and the defendant's combination cannot produce the results claimed for that of the complainants. We have said that the new results claimed, whatever they may be, are not the production of the combined devices common to both stoves. The devices used by the defendants produce no new effects, because used in combination. The space around the fire pot leading to the base doubtless secures the beneficial results long known to follow the use of revertible flues. It may be conceded to be an equivalent for such flues: but the results of its construction are not changed by the fact that a flaring fire pot and a supply reservoir, with a contracted discharge end and openings for illumination, are used in the same stove. It still operates to conduct the products of combustion to the base and into the exit flue. No new operation is given to it by the combination. The same may be said of every other device employed by the defendants, which is also in the complainant's combination. Each produces its appropriate effect unchanged by the others. That effect has no relation to the combination; in no sense can it be called its product. Thus far nothing novel is produced. This, then, is a mere aggregation of devices, not invention, and consequently the use of those devices, either singly or together, can be held to be any infringement of rights belonging to the complainants.

We pass now to consider more in detail the claims in the complainants' patents, which it is alleged the defendants have infringed. The first in the reissued patent, dated February 3, 1863, is unquestionably too broad to be sustained, unless limited to the means described in the specification. So it was doubtless intended by the patentees to be limited, for the claim speaks of the combination claimed "substantially as described," that is, described in the specification. Thus limited, one of its essential elements is a closed combustion chamber over the fire pot, formed by a flange of the reservoir resting on the upper edge of the pot, and provided with perforations or ears connecting with two flues passing downward. This element is indispensable for the purposes asserted in the claim, as well as in the specification. And the peculiar construction of the chamber is more than formal. It is functional. It prevents the passage of the flame and other products of combustion up, around, and over the supply reservoir, which is a leading avowed object of the invention, precisely the improvements patented. But this constituent of the combination the defendants have never used, nor have they used any corresponding device, or device producing the same results.

The second claim is for contracting the discharge end of the coal supply reservoir, expanding the fire pot, and extending the flame passage downward for united operation in a base burning coal supply reservoir stove or furnace, essentially as set forth. The means set forth for extending the flame passage downward are perforations through the flange, forming the lateral boundary of the closed combustion chamber, or ears leading thereout, and close flues extending from the ears or perforations downward at some distance from the fire pot, through a space bounded on one side by the fire pot, and on the other by an outer casing of the stove, perforated for the admission of external air. It might, perhaps, be questioned whether there is any device in the defendant's stove corresponding to this; but, waiving the consideration of that question, it is very evident that the combination of the three devices named is not the work of invention. They have no relation to each other. Neither the form of the feeder nor the shape of the fire pot bears at all upon the direction of the draft passages. There is no novel result flowing from the joint operation of the three devices. The revertible flues have no more to do with a stove supplied by a feeder than they would have with a stove supplied by hand. There is, therefore, nothing in this claim that interferes with what the defendants have done.

An essential element of the combinations mentioned in both the third and fourth claims is the closed combustion chamber, formed in part by a circular flange extending outward and closing on the top of the fire pot, with perforations in it, or ears for connection with the downward flues, or it is those perforations or ears leading out of such a chamber to the descending passages. These devices the defendants do not employ, and they cannot be used in the defendants' stove. There has been, therefore, no infringement of these claims.

The fifth claim is the only remaining one contained in the reissue which the defendants are alleged to have invaded. It is constructing the fire pot of a base burning stove with an imperforated circumference, and in the form of a trumpet mouth at its upper extremity, in combination with descending flame passages, substantially as described, and for the purposes set forth. How in combination? As described in the specification, united by means of perforated flanges or ears of the pot, involving, of course, the presence of a closed combustion chamber constructed substantially as already described. Construing the claim thus, as we think it must be construed, the defendants have been guilty of no infringement.

Passing now to the second patent, issued August 11, 1863, we observe that its first claim was for a combination of the illumination openings, flame expansion chamber, coal supply reservoir, fire pot, descending flue, and draft flue, substantially in the manner and for the purpose described. In the main, this is the same combination as that claimed in the reissued patent we have had under consideration. The only change is the addition of illumination openings. These were a well known device applied to stoves long before either of the patents were granted. They perform no peculiar office in the new combination. They have no possible relation to it. They do not affect, in the slightest degree, the results of that combination, whatever they may be. It is impossible to regard the mere addition of such openings to a stove containing the improvements described in the reissued patent as the formation of a new patentable combination. It is not invention. If, however, it were, the defendants have not trespassed upon it, for of the combination the peculiarly formed close expansion chamber is an essential constituent, and that is not found in the defendants' stove.

Similar remarks might be made respecting the second claim of the patent of August, the only remaining one alleged to have been infringed. All the elements of the combination have not been used by the defendants.

The decree of the circuit court is affirmed.