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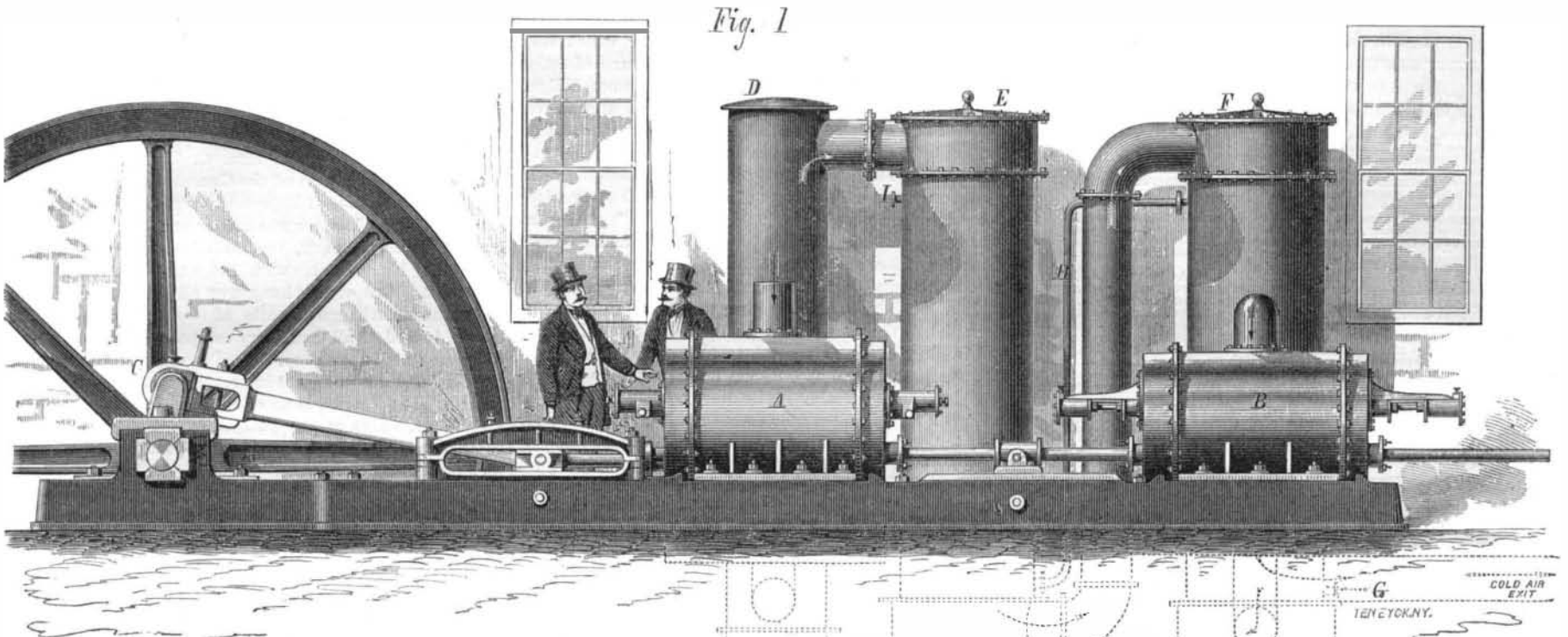
IMPROVED ICE AND REFRIGERATING MACHINE.

The various inventions which, during late years, have been devised for purposes of refrigeration, or for the manufacture of ice, may be divided into three principal classes: (1) Those in which evaporation is effected in a vacuum, the process being assisted by the use of an air pump, as in the ether machines of Messrs. Siebe, Tellier, and others. (2) Those in which air is first compressed and afterwards expanded, or, more generally speaking, those in which heat is applied in order to ultimately produce cold, exemplified in the apparatus of Kirk of Glasgow, Mignot of Paris, and the Windhausen invention, to which the following description will more particularly refer. (3) Those in which cold is produced by the direct action of heat without the use of power, as in the case of refrigeration by the liquefaction and subsequent vaporization of ammonia, to which class belong the systems of Carré, Reece, Mort, and others of more recent date. In addition to the machines coming under the above heads, may be noted others employing freezing powders and different hydrocarbons, numbers of which, possessing various degrees of merit, exist both in this country and abroad.

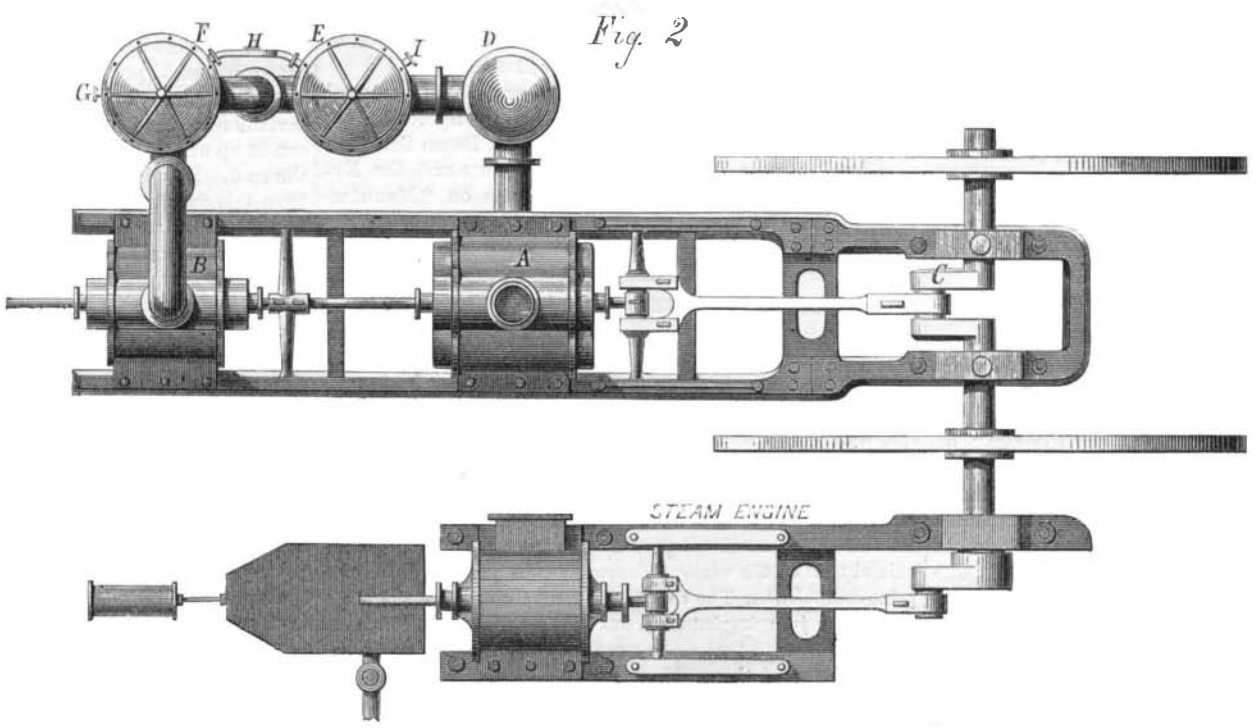
Fig. 1



THE WINDHAUSEN ICE AND REFRIGERATING MACHINE.

The Windhausen apparatus, which our engravings illustrate, was first patented in Germany; and in March, 1870, similar protection was obtained for it in the United States. It has already found general notice in our columns in connection with other devices of similar construction, and may be fairly considered as among the most successful machines of its class yet produced. The principle upon which it is based is one of the simplest in physics, namely, that the compression of the atmosphere generates heat, and its subsequent expansion, cold; an axiom too generally understood to need explanation here. The particular mode of its application in the present instance is, however, an important point; and, indeed, the entire efficiency of the device is claimed to rest upon the circumstance that, instead of cooling the air heated by compression by means of running water, and then conducting it directly to the space or apartment to be refrigerated, it is led into a chamber where dilation takes place. In brief, expansion is effected by the simultaneous action of the machine before the air is sought to be utilized.

Fig. 2



Our engravings present an elevation, Fig. 1, and plan view, Fig. 2. A is the compression cylinder, and B the expansion cylinder, both of which are worked simultaneously by power applied to the crank, C, by the low pressure engine shown in the lower portion of Fig. 2. Air enters in the direction of the arrow into the upper part of cylinder, A, which is of such dimensions that, at every move of the piston, nearly thirty-five cubic feet of air, or, as the former is double acting, twice that number, are compressed with every revolution of the engine. Thirty-six revolutions per minute, for example, compress 150,000 cubic feet per hour, and at a pressure, it is stated, of only 35 pounds per square inch, that is, reducing two and a half volumes of air to one volume. Supposing the air on entrance to be at 80° Fah., it is stated that, after compression, experiment proves its temperature to be 205°, indicating a gain, therefore, of 125°. Leaving the cylinder, A, the current enters the condenser, D, from which, in the direction of the arrow, it passes to a similar receptacle, E, thence down, as indicated by dotted lines in Fig. 1, to another cooler, F. Within these chambers, are arranged series of pipes through which the blast passes, and which are surrounded by a current of cold water which enters at G (dotted lines, Fig. 1), passes up through the cooler, F, through pipe, H, through the next cooler, and emerges at I. The effect of this water is to abstract a portion of the heat imparted by compression, reducing the temperature of the air to a few degrees above that of its natural state, the extent of this reduction depending upon the temperature of the water and the length of time the air is submitted to its action. An atmosphere is thus obtained which, although under two and a half compressions, is but slightly warmer than the ordinary air previous to treatment, while the expansive force and effect of a volume two and a half times larger is retained. Consequently, it is claimed that the 125° of temperature above noted are clearly gained.

In this condition the air enters cylinder B, where the expansion takes place under a gradually diminishing pressure, regulated by automatic valves worked by the simple expansive force of the compressed air itself. To dilate the latter to its normal volume, it is evident that the same amount of heat is required as was abstracted by the water; but this can only be partially returned by the small quantity of air within the expansion cylinder, so that a low degree of temperature is at once obtained. This is still further reduced with every movement of the machine, as the original air in the expansion cylinder becomes colder, or rather replaced by the cooled and compressed atmosphere. As the compression and expansion cylinders are simultaneously double acting, the latter receives its supply only from the former, so that the compressed air is expanded by one and the same process; hence, if 150,000 cubic feet are compressed in one hour, necessarily the same amount must be expanded in a similar time.

From the cylinder, B, the air escapes into the space to be refrigerated with great velocity, sufficient, it is stated, to be capable of conducting the current through channels two feet in diameter a distance of 300 feet from the exit aperture, the measured temperature of the air at the orifice being from 30° to 35° below zero Fah. It is also asserted that under a pressure of 35 pounds to the square inch, at 33 or 34 revolutions per minute, the machine has, with an inadequate supply of water, since its erection at New Orleans, produced a temperature of 54° below the Fahrenheit freezing point. The apparatus, it is claimed, will sustain a pressure of 85 pounds per square inch, or nearly six atmospheres, producing a most intense cold, scarcely susceptible of thermometrical measurement. Perfectly dry cold air is said to be formed, the contained moisture being condensed into snow and appearing at the exit orifice.

This machine, we are informed, has already received the

first prize at the Vienna Exposition. The apparatus now operating in New Orleans was built by Eygels, of Berlin, and was the first constructed on a large scale in Germany. The driving engine is 31x36, and works at from 50 to 55 pounds pressure. The patent right for the entire continent has been purchased by the Windhausen Ice Making and Refrigerating Association of North America. Further information may be obtained by addressing the President of the Company, Mr. J. Kruttschnitt, Lock Box 144, New Orleans, La.

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NEW YORK, SATURDAY, AUGUST 9, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

IS IT A DASTARDLY OUTRAGE?

EXECUTIVE DEPARTMENT, INTERNATIONAL UNION OF MACHINISTS AND BLACKSMITHS.

CLEVELAND, OHIO, July 21, 1873.

MESSRS. MUNN & CO:

Dear Sirs:—Enclosed please find a copy of an oath required by Messrs. Stearns, Hill & Co., of all the men in their employ and all who apply to them for employment. I think you will agree with me in pronouncing this attempt, on the part of the firm in question, to rob men of their liberties as one of the most dastardly outrages, on the rights and prerogatives of American freemen, ever attempted in this country since the ratification of the Declaration of Independence. I admired your criticism on the Joliet (Ill.) Iron and Steel Co., and send you the enclosed, feeling confident you will do the matter justice. I remain,

Respectfully yours, JOHN FEHRENBATCH.

The following is a copy of the paper referred to in the above letter:

APPLICATION FOR EMPLOYMENT.

STEARNS, HILL & CO.

I.....make this application for employment in the manufactory of Messrs. Stearns, Hill & Co., and in all good faith do declare, that I am not now a member of, nor will I, during any part of the time I may remain in the employ of said Stearns, Hill & Company become a member of any "Machinists' and Blacksmiths' Union," or any other society or association which assumes to control or regulate the relations existing between employers and workmen in any business whatsoever; and that I will not countenance or assist in any combination of workmen having in view any interference whatsoever with the business of said Stearns, Hill & Company, and I hereby agree with said Stearns, Hill & Company, that in case I have made any misstatements in this application, or in case I shall violate any of the conditions of the agreement herein contained, I shall forfeit to said firm of Stearns, Hill & Co., any and all pay that may be due me at the time of the discovery by them of such misstatement or violation of agreement.

Witness my hand and seal at Erie, Pa., this.....day of..... 187 .

.....L. S.

Erie County, ss.

Personally comes the above named.....who being duly sworn, deposes and says: That all statements by him made in the foregoing application are true.

Sworn and subscribed before me this..... day of.....A. D. 187 . } .....

As the above documents instance another case of the oft recurring difficulties between employer and employee, we propose to make them the subject of brief comment. At the outset, it may be noted that there is no parallel between the "application" quoted and the "receipt and contract" of Joliet (Ill.) Iron and Steel Company recently alluded to in these columns, as intimated by our correspondent. The latter was an acknowledgment for a sum received, accompanied by an agreement by the workman to conform to certain conditions in consideration of receiving his legally due wages. These provisos released the company from damages for accident to the signer from any cause, gave it the right to discharge him at a moment's warning but prevented him from leaving his situation without 14 days notice in writing, under penalty of forfeiture of his earnings, and, besides, imposed other restrictions, *ex post facto* in operation, and hence clearly oppressive and unjust. In that case the employee was obliged to yield to a disadvantage to get his money after he had worked for it, and hence a moment's thought will show the circumstances to be entirely different from those now under consideration.

Enclosed with the letter of our correspondent is a printed hand bill addressed to the public. So far as we are able to understand its purport, it consists of an answer to statements made by Messrs. Stearns, Hill & Co., in relation to matters of internal regulation of their shops, subjects which to our mind are peculiarly the business of the above firm and not at all of the public. There are also some remarks about individual difficulties and recriminations, possessing no general interest, so that, in fine, from all the evidence before us, the trouble narrows itself down to the simple fact that Messrs. Stearns, Hill & Co., for doubtless good and, to them, sufficient reasons, have seen fit to exclude society men from their works. Now, we hardly imagine that the Union to which we are indebted for the above epistle or any other association will have the hardihood to deny that the firm has a perfect right to do exactly what it pleases with its own property and manage its affairs as it thinks best, so long as its doings are legally conducted and no unjust or oppressive measures are exerted. If a concern should decide to employ only society men, to the exclusion of all others, would not a "dastardly outrage" then be committed on the latter? And is not one party, if either, as much entitled to consideration as the other? Clearly we think the employers can exclude from their establishment whatever person or persons they choose, and the remarks of our correspondent, based on this grievance, in the usual exaggerated mode of expression common to the trades union harangue, are entirely misplaced and without substantial foundation.

We are of opinion, however, on the other hand, that the requiring of workmen to sign agreements by which they bind themselves to any definite or prescribed course of action is not sound policy. It is true that the hand is not obliged sign, and that he can refuse the situation as the alternative; but documents of legal form, no matter how innocent in tenor, are, by men possessing but vague ideas of the law and its restrictions, almost invariably misapprehended, just as in the present case the above form of application is stigmatized as "bond and mortgage" and "death warrant." The relation of employer and employee is very simple and requires no such formality; the former, if he wishes to exclude society men from his establishment, should inform himself fully as regards a hand before hiring him; and after arrangements are completed, the man can be easily made to understand that his first overture toward trade union fallacies will bring prompt dismissal and disqualification for re-employment. Documents of almost any description are sure to be seized upon by unscrupulous persons as a tangible basis for unfounded assertion. The mere fact of a paper existing is enough for them to exaggerate its purport in order to work upon the passions of the ignorant, and thus foment difficulties alike prejudicial to the interests of employers and employed.

THE VIENNA SHOW.

In another column will be found an interesting letter from our special correspondent, Professor Thurston, from which we learn that he has safely arrived in Vienna and commenced his examination of the great show. His first impressions of the display are here given, and we cannot refrain from remarking how completely the statements made, as regards American exhibits, accord with the views expressed by us before the opening of the Exposition. The United States section is but poorly filled, a fact under the circumstances to be expected; but there is unquestionably an overwhelming display of American inventions coming from the workshops of foreign manufacturers. Close imitations of even our locomotives, our correspondent tells us, are to be found in the space allowed to other countries, exhibited not only as specimens of the handiwork of their makers, but as American devices, a fact cited as a means of recommendation. In spite, therefore, of the poverty of our individual exhibit, it will be seen that we are abundantly represented, not merely through advertising our own products to the world's notice, but by having them heralded for us by other nations through the sincerest flattery of imitation.

The Fourth of July in Vienna was the occasion of a colossal jollification by all the Americans in the city. Speeches were made by Messrs. Schultze and Adams, and Baron Senborn; also by Professor Thurston on "Agriculture and the Mechanic Arts;" by Mr. Hill of Massachusetts on "Manufactures in the Old and New Worlds," and on "Science" by Professor Horsford.

PROGRESS OF CABS.

The inhabitants of London and other European cities enjoy luxuries in the way of conveyances that the people of our American cities know but little about. We allude to hacks and cabs, of which some 10,000 are employed in London, and which convey two passengers anywhere within a distance of a couple of miles for 25 cents.

At the International Exhibition, London, a committee, of which the Duke of Beaufort was chairman, and Lord Somerset and other prominent persons members, recently made an official trial of the various improved cabs presented for the prize competition. The committee went through considerable exercise in jumping into and out of the various vehicles, and finally concluded that there were no very notable improvements in any of them.

One of the best was a novelty in the shape of a cab for four persons, set on very small wheels. The idea was that such vehicles may be started and stopped more easily than the large wheeled machines. The traction of the small wheels is a little more, but it was contended that the sum of the work upon the horse, in ordinary cab traffic, is less than the large wheeled vehicles.

Another improvement for two wheeled cabs was a shifting ballast box which the driver could readily move at pleasure, and thus counterbalance the weight of the vehicle in respect to its pressure upon the horse's back, to correspond with the number of passengers occupying the interior of the cab.

A GREAT UNRECOGNIZED INVENTOR.

Under this heading the *Wool Bulletin* devotes a half column to the consideration of the marvelous advantages that have been conferred upon this country and the world in general by the mechanical duplication of parts, in the manufacture of machinery; an idea which, it alleges, is of American origin. The *Bulletin* says:

"The American manufacture of implements and smaller machines owes its superiority not only to a larger use of machine tools, but to an idea more important in its results than any merely mechanical invention, and one which is unquestionably of American origin. This idea is the making each of the several parts of many different machines interchangeable. For instance, in making a lot of muskets, the manufacturer does not fabricate each musket separately, but he constructs each of the smallest pieces of ten thousand muskets, it may be, separately, and makes them so precisely alike that each will fit exactly any one of the ten thousand muskets. It is this system which makes it possible for a single factory of arms in this country to make more muskets in a day than can be made in all England in a month. It is this which enables us to supply all Europe with arms and to export sewing machines to all the European nations, notwithstanding the vastly higher cost of our labor. The name of the inventor of this, perhaps the greatest of all American inventions, but one which from its nature could not be secured by patent, is hardly known out of his own town; and the object of this note is to place it on record.

"We have received from Hon. C. C. Chaffee, of Springfield, formerly chairman of the Committee of Patents in the United States House of Representatives, the following note:

"Mr. Thomas Warner was master armorer at the time the musket, in all its parts, was made interchangeable. He is credited by his associates with the suggestions that led to the result. Out of this has grown all the enormous industry of the interchange of parts of sewing machines, watches, and indeed of all machinery composed of a large number of pieces; and, as you say, it was the 'greatest discovery of the age,' and like all great improvements it has been one of growth. Mr. Warner is now in his eightieth year, is hale and hearty, walks to the post office every pleasant day—three quarters of a mile—and is very justly proud of what he has done for mechanics."

We appreciate very highly the motive of our cotemporary in his desire to render honor to whom honor is due; but regret that his statements are not supported by the facts of mechanical history.

Perhaps Mr. Warner, as boss of the armory, was the first to suggest, in that concern, the making of the parts of the musket interchangeable; but he most assuredly was not the first inventor or suggestor of that method in respect to the manufacture of machinery in general. It was unquestionably *not* of American origin. It was a common mechanical expedient in use in the old country before Warner was born, or the Springfield Armory thought of.

How entirely at home the Yankee is in the art of self puffery! He takes to it like a young duck to the water. "It is this system," he modestly alleges, "which makes it possible for a single factory of arms in this country to make more muskets in a day than can be made in all England in a month. It is this which enables us to supply all Europe with arms and to export sewing machines to all European nations, notwithstanding the vastly higher cost of our labor." We are sorry that there is so little basis for so much of the spread eagle.

In respect to fire arms and sewing machines, while it is true that we export them, to some extent, the quantity sent abroad is but as a drop in the bucket compared to the aggregate continental production of these goods.

The practice of Europeans, when they find an American invention to be profitable, is to order goods here until they can fit up or import the machinery for the manufacture on the spot. It is in this way that a temporary exportation from this country, of certain novel kinds of mechanism, is from time to time produced. But it is only temporary, because Europeans have the same appliances that we possess, while they pay less for wages and living than the manufacturers of this country. It is therefore impossible at present greatly to extend the exportation of American machinery. But if the prices of coal and iron shall continue to rise in Europe, it will then be possible for the United States to do a great mechanical trade with England and the continent.

CONCRETE FOR BUILDING PURPOSES.

An esteemed correspondent writing from Indianaoplis says: "I would like to know something about the construction and durability of cement gravel houses, and I write you for the information. Are they durable? What is the cost of building as compared with a like quality of brick or frame? Is it better to make foundation of brick or stone instead of cement? We have an excellent gravel bed for foundation."

In reply to our correspondent, we would say that the durability of concrete walls depends upon the quality of the ingredients. If the sand and the cement are of good quality, the walls will be quite as durable as stone walls. The walls of some of the ancient buildings of Rome, such as the Coliseum and the Baths of Caracalla, were built partly with concrete and partly with stone, and the concrete remains as durable as the stone. Many buildings with concrete walls have been erected in the United States; and so far as they