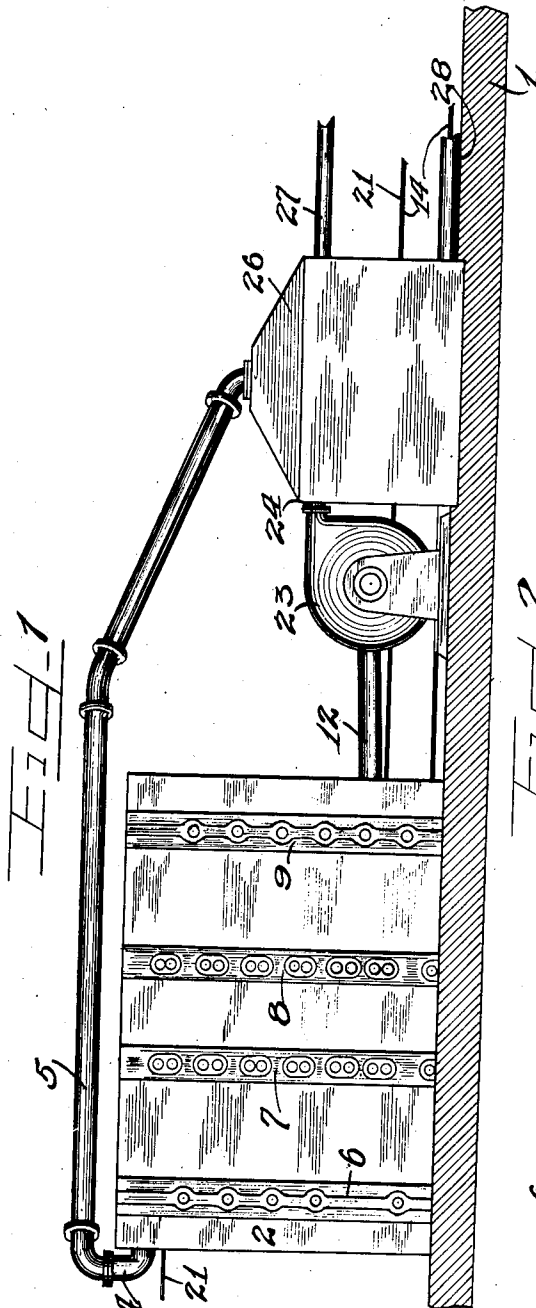


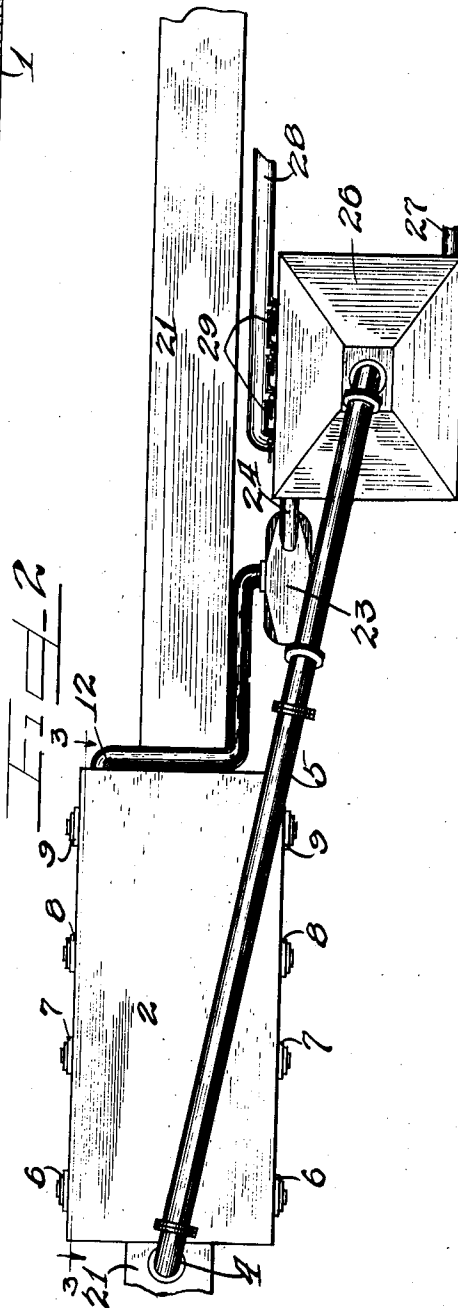
J. E. ALEXANDER.
 DEVICE FOR PREHEATING AIR FOR USE IN PAPER MAKING MACHINES.
 APPLICATION FILED NOV. 26, 1917.

1,330,155.

Patented Feb. 10, 1920.
 3 SHEETS—SHEET 1.



Witnesses
Rudolph J. Berg
Charles H. Hill



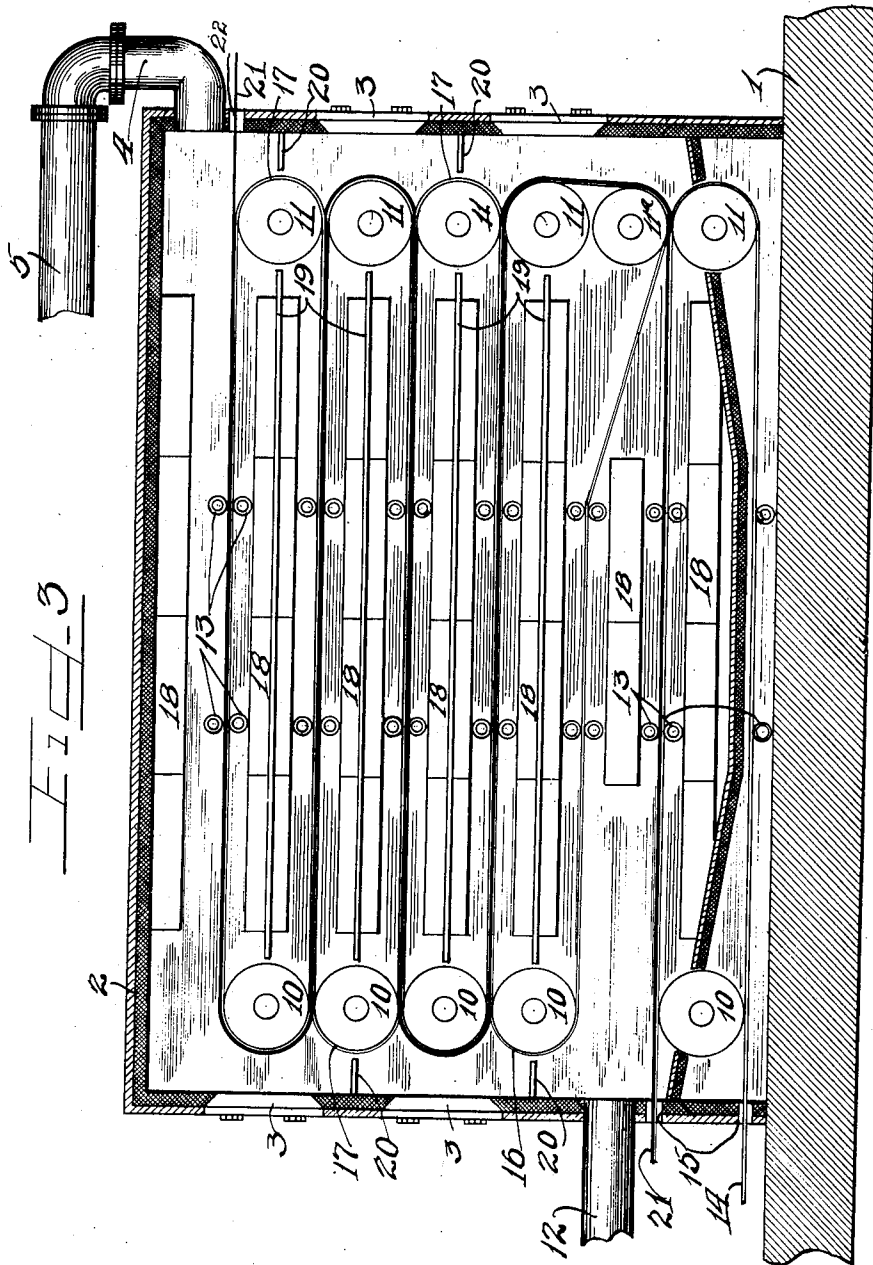
Inventor
John E. Alexander
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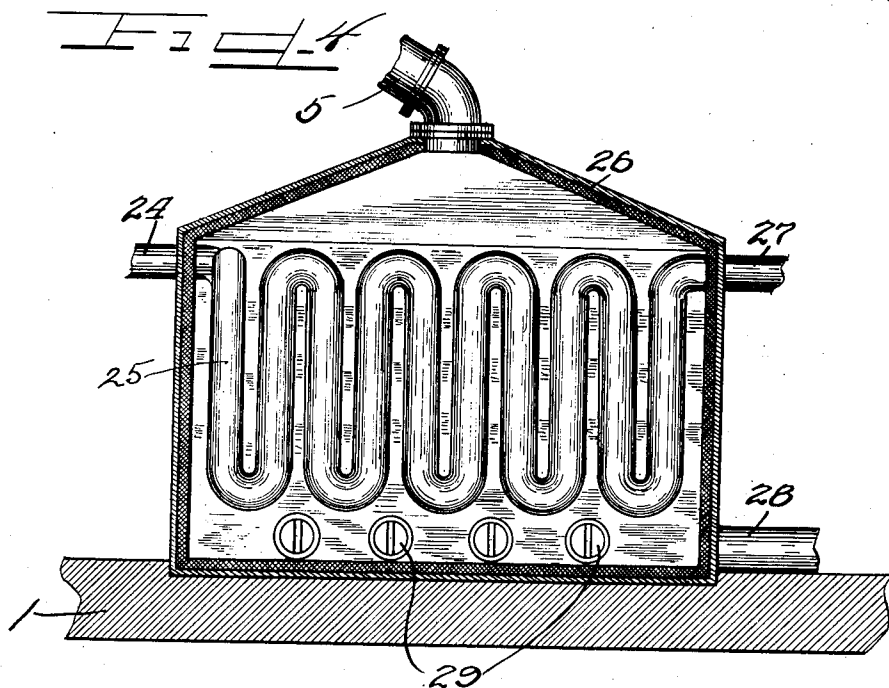
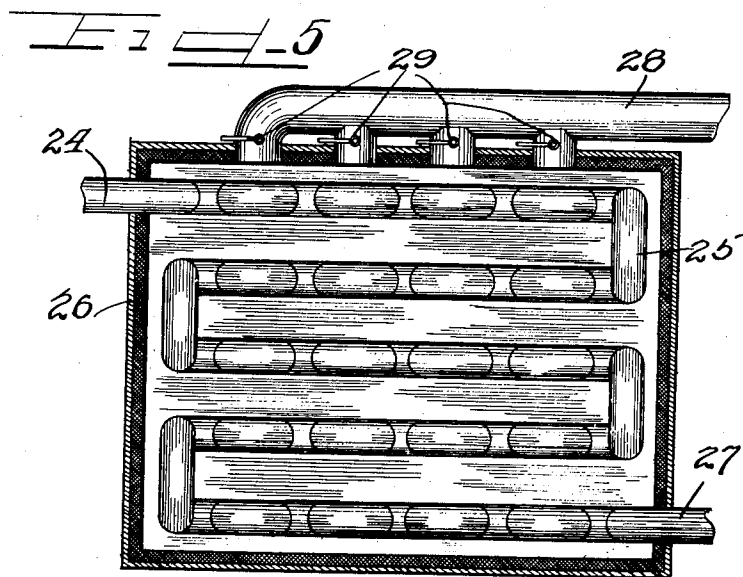
Inventor
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 By Charles W. Hill, Atty.

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3 SHEETS—SHEET 3.



WITNESSES
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UNITED STATES PATENT OFFICE.

JOHN E. ALEXANDER, OF PORT EDWARDS, WISCONSIN.

DEVICE FOR PREHEATING AIR FOR USE IN PAPER-MAKING MACHINES.

1,330,155.

Specification of Letters Patent.

Patented Feb. 10, 1920.

Application filed November 26, 1917. Serial No. 204,087.

To all whom it may concern:

Be it known that I, JOHN E. ALEXANDER, a citizen of the United States, and a resident of the city of Port Edwards, in the county of Wood and State of Wisconsin, have invented certain new and useful Improvements in Devices for Preheating Air for Use in Paper-Making Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This application covers a preheater which is shown but not claimed in my application for patent for a "drier for paper-making machines," filed November 26th, 1917, Serial No. 204,085.

The invention more particularly relates to a preheating device for paper-making machines wherein atmospheric air admitted into the device is heated by means of heat derived from a main heating unit or drier before said air is permitted to enter said main heating unit or drier of the paper making machine, wherein the air is further heated for the purpose of drying the web in the process of paper manufacture.

It is an object of this invention to construct a means for use in a paper-making machine for heating air before it passes into the drying unit of the machine.

It is also an object of this invention to provide a device adapted for use in a paper-making machine to heat incoming air before it enters the drying unit of the machine by means of heat derived from heaters contained within said drying unit.

A further object of the invention is the construction of a mechanism adapted to preheat air by means of steam before said air enters the drier unit of a paper-making machine, said steam being derived from moisture evaporated from paper under process of manufacture as the paper is dried by said preheated air which is further heated in said drying unit.

Another object of the invention is the construction of an auxiliary air heating device for a paper-making machine wherein air is first heated in its passage into a drier unit by means of steam formed in said drier

unit during the drying process of a paper web conducted between heating elements in said drier unit which tend to increase the temperature of said preheated air for the evaporation of moisture from said paper web to form the steam which is used as the heating medium in the auxiliary heating device.

An important object of this invention is the construction of a paper-making machine wherein atmospheric air used in the drying process of paper web is first heated by means of exhaust heat derived from the drying unit of the machine.

Other and further important objects of this invention will be apparent from the disclosure in the drawings and specification.

The invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a side elevation view of a paper drying machine equipped with an auxiliary heater embodying the principles of this invention.

Fig. 2 is a top plan view thereof.

Fig. 3 is an enlarged section taken on line 3—3, of Fig. 2, with parts shown in elevation.

Fig. 4 is a central vertical section taken through the device embodying the principles of this invention, showing parts in elevation.

Fig. 5 is a top plan view of the interior thereof showing the walls in section.

As shown on the drawings:

The reference numeral 1, indicates a floor or foundation upon which is rigidly mounted a drier unit comprising a casing or box 2, provided with doors or manholes 3, in each end thereof to afford a means whereby access to the interior mechanisms of the drier unit may be had. Secured in a suitable opening near the top of one end of said casing 2, is an air inlet elbow 4, which is connected with one end of an air inlet or feed pipe 5. Mounted securely in the exterior of each side of the casing 2, in parallel relation to one another are a plurality of vertical bars or bearing members 6, 7, 8 and 9, provided with suitable openings or passages, as clearly shown in Fig. 1. Rotatably mounted within the casing 2, and

near one end thereof are a plurality of superimposed transversely arranged cylindrical rollers 10, the ends of which are journaled in the apertures of the bearing members 6. Also rotatably mounted within the casing 2, near the other end thereof are a plurality of superimposed transversely arranged cylindrical rollers 11, having the ends thereof journaled in the openings of the bearing members 9. The number of rollers 11, is one greater than the number of rollers 10, and said rollers 10 and 11, are disposed opposite one another with the exception of the extra roller 11^a, which is disposed above the lowermost roller 11, and opposite an outlet pipe 12, one end of which projects through the lower portion of the end wall adjacent the rollers 10.

Disposed transversely within the casing 2, are two vertical rows of parallel guide rollers 13, superimposed one above the other, and having the ends thereof journaled in the opening of the bearing members 7 and 8, respectively. Said guide rollers 13 are arranged intermediate the rollers 10 and 11. Engaged around the lowermost roller 11, is one looped end of an endless feed belt 14, made of felt or fine wire mesh. Said feed belt 14, engages the lowermost roller 10, and passes over certain of the guide rollers 13, and passes through suitable openings 15, in one of the end walls of the casing 2, out of said casing and around other rollers not shown, but disposed below a pulp feeding apron. Engaged around the roller 11^a, and around the rollers 10 and 11, which are disposed immediately above the lowermost roller 10, and above the roller 11^a, respectively, is an endless felt or wire mesh belt 16, which is trained between certain of the guide rollers 13. An endless belt 17, made of felt or wire mesh is trained around each of the upper pairs of oppositely disposed rollers 10 and 11, and between certain of the guide rollers 13.

Arranged within the casing 2, between the rollers 10, 11 and 13, are a plurality of longitudinally and horizontally positioned heating elements or grids 18. Rigidly secured within the casing 2, and to the heating elements 18, are a plurality of horizontal longitudinally disposed baffle plates 19, dividing the interior of the casing 2, into a plurality of spaces or compartments, the ends of which are open and form a continuous passage within the casing with the aid of a number of horizontal auxiliary baffle plates 20, arranged alternately with respect to one another and secured to the inner surfaces of the end walls of the casing.

Deposited upon the upper surface of the feed belt 14, by suitable machines not shown, is a pulp or web 21, which is to be dried to form paper. Said web 21, when the device is in operation, is carried along by the feed

belt 14, up onto the belt 16, and then between and over the belts 17, and the drying elements 18, out of the casing 2, through a suitable opening 22, near the upper end of one of the end walls of the casing to suitable calender rolls, not shown.

As clearly shown in Figs. 1 and 2, the other end of the outlet pipe 12, leading from the casing 2, of the drier unit, is connected with a suction pump or other suitable device 23. Also connected with the suction pump 23, is a pipe 24, the other end of which connects up with one end of a pipe coil, radiator or exhaust heater 25, disposed within a casing or box 26, of an auxiliary or preheating device which is rigidly mounted upon the foundation 1, adjacent the suction pump 23, and has an opening in the upper end or top of the casing 26, thereof for receiving the other end of the feed pipe 5, connected therein. The pipe coil 25, is continuous and may be of any desired form, the other end thereof connecting up with an exhaust pipe 27, which projects through the casing 26. Said exhaust pipe 27, may be of any desired length in order that the same may exhaust into the atmosphere at a distance sufficiently remote from the paper-making machine. As shown in Figs. 4 and 5, it will be seen that the interior of the pipe coil 25, disposed within the casing 26, of the preheating unit does not communicate with the interior of said casing but merely affords a continuous passage through said preheating unit for the exhaust from the drier unit.

An air intake or inlet pipe 28, provided with a plurality of valves 29, is connected up with the lower portion of the casing 26, to afford an entrance for atmospheric air. The valves 29, project into one of the walls of the casing 26, near the lower end thereof and are adapted to be operated independently of one another to control the flow of air into the preheating unit.

The operation is as follows:

Pulp to be formed or made into paper is run onto an apron of a paper-making machine and is deposited upon the feed belt 14, which may be made of felt, wire mesh or other suitable material. The deposited pulp after passing through parts of the paper-making machine (not shown) is formed into the web 21, which requires drying during the process, in which the web is made into paper. For the purpose of drying the web 21, the same is carried along in a continuous ribbon or tape form upon the belts 14, 16 and 17, and passes upwardly through the series of superimposed heating elements 18, and leaves at the top of the casing 2, where it passes to calender rolls (not shown). The baffle plates 19 and 20, are used so that the air entering the top of the casing 2, through the elbow 4, will pass in between the heating elements 18,

downwardly in a continuous passage and out through the outlet pipe 12, thereby thoroughly drying the web not only along its edges, but evenly all the way through.

5 The heating elements are independent of one another and may accordingly be regulated to obtain graduated temperatures if so desired. The air which is used as the drying medium in the drier unit is adapted to be heated by said heating elements 18, to a temperature, sufficient to draw the moisture out of the web 21, which moisture mixes with the hot air and forms a steam. The suction pump 23, which may, of course, be
10 operated by any suitable source of power, acts to suck or draw the steam out of the casing 2, through the pipe 12, the pump 23, and the pipe 24, and then forcing said steam through the radiator pipes 25, and out through the exhaust pipe 27. The passage of the exhaust steam through the radiator pipes 25, tends to heat the same thereby causing a preheating of the atmospheric air in the preheating unit before said air passes through the pipe 5, into the drier unit. The circulation of the air and exhaust steam through the drier unit and the preheating unit is performed by the suction pump 23.
25 From the above description it will be noted that use is made of the exhausted heat units to preheat the atmospheric air entering the paper-making machine before it enters the casing 2, for further heating, and that the constant drawing out of the steam formed in the drier unit affords a ready means for drying the web 21, rapidly and uniformly throughout.

The object of providing a number of air inlet valves 29, in the intake pipe 28, is to afford a means for regulating the flow of air into the casing 26, and also insure an even distribution of the entering air into said casing 26, to permit the entering air to be evenly preheated by the radiator pipes
45 25, before said air enters the casing 2.

An important feature of the invention is the construction of an air preheating device adapted to be used in combination with a drier unit of a paper-making machine, whereby exhausted heat units derived from the drier unit are used to heat air before the same enters the drier unit. It will, of course, be understood that the preheating unit may be made in numerous different
50 ways without departing from the principles of the invention.

From the description and operation of the device, it will be seen that a process of manufacturing paper has been developed, wherein a pulp web is evenly dried by passing the same through a drier unit, the drier medium being heated air which is preheated by means of a preheating unit which heats atmospheric air before the same enters the
60 drier unit, by means of exhausted heat units

derived from an exhaust steam formed in the drier unit during the drying process of said web.

Numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted otherwise than necessitated by the prior art.

I claim as my invention:

1. An air preheating device for use with a drier for a paper-making machine, said device comprising a casing connected with said drier to supply preheated air thereto, a curved radiator pipe therein connected with said drier, and valve controlled air intake pipes connected with said casing.

2. An air preheating device for use with a drier for a paper-making machine, said device comprising a casing, an air inlet pipe connecting the same with said drier, suction means connected with said drier, a heating element in said casing connected with said suction means and projecting out of said casing in the form of an exhaust pipe, valve controlled air intake means connected with said casing, said heating element adapted to preheat the air from said air intake means by means of the exhaust from said drier before said air passes through said air inlet pipe into the drier.

3. In a paper-making machine, the combination with a drier unit, of an air inlet pipe connected therewith, a casing attached to said inlet pipe, a heating element in said casing having the ends thereof projecting outwardly therefrom, a suction pump connected with one projecting end of said heating element and also connected with said drier unit, the other projecting end of said heating element serving as an exhaust, and valved air intake means connected with said casing to admit air into said casing where the same is heated before passage into said drier unit by means of the exhaust from said drier unit which is forced through said heating element by said suction pump.

4. An air preheating device of the class described comprising a casing, a curved radiator pipe disposed therein, a pump connected with one end of said radiator pipe for forcing hot air and steam therethrough and out of the other end of said radiator pipe, an air inlet pipe connected with said casing, a plurality of independently adjustable valves therein for controlling the supply of air to said casing, and an outlet pipe connected with said casing to permit the escape of the air from said casing after it has been heated by said radiator pipe.

5. The combination with a drier and the heating elements thereof, of an air preheating device comprising a casing connected with said drier, means connected with the casing initially supplying air at atmos-

pheric temperature to said casing and drier
to be heated by said drier heating ele-
ments, and means in said casing connected
with the drier to receive the heated exhaust
5 air therefrom to preheat the air from said
air supplying means before it enters the
drier.

In testimony whereof I have hereunto
subscribed my name in the presence of two
subscribing witnesses.

JOHN E. ALEXANDER.

Witnesses:

EARL M. HARDINE,
CHARLES W. HILLS, Jr.