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MECHANICAL DEVICE FOR CREATING FORCED DRAFT.  
APPLICATION FILED JULY 13, 1909.

1,058,385.

Patented Apr. 8, 1913.

Fig. 1.

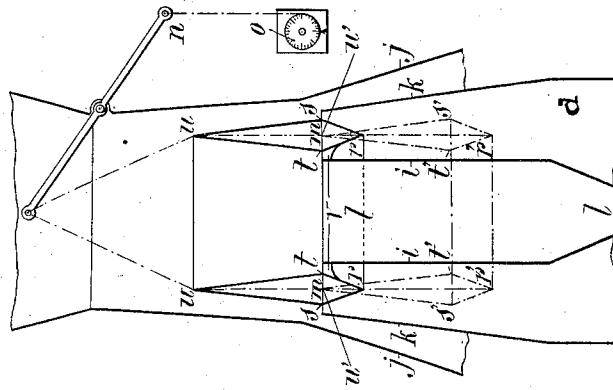
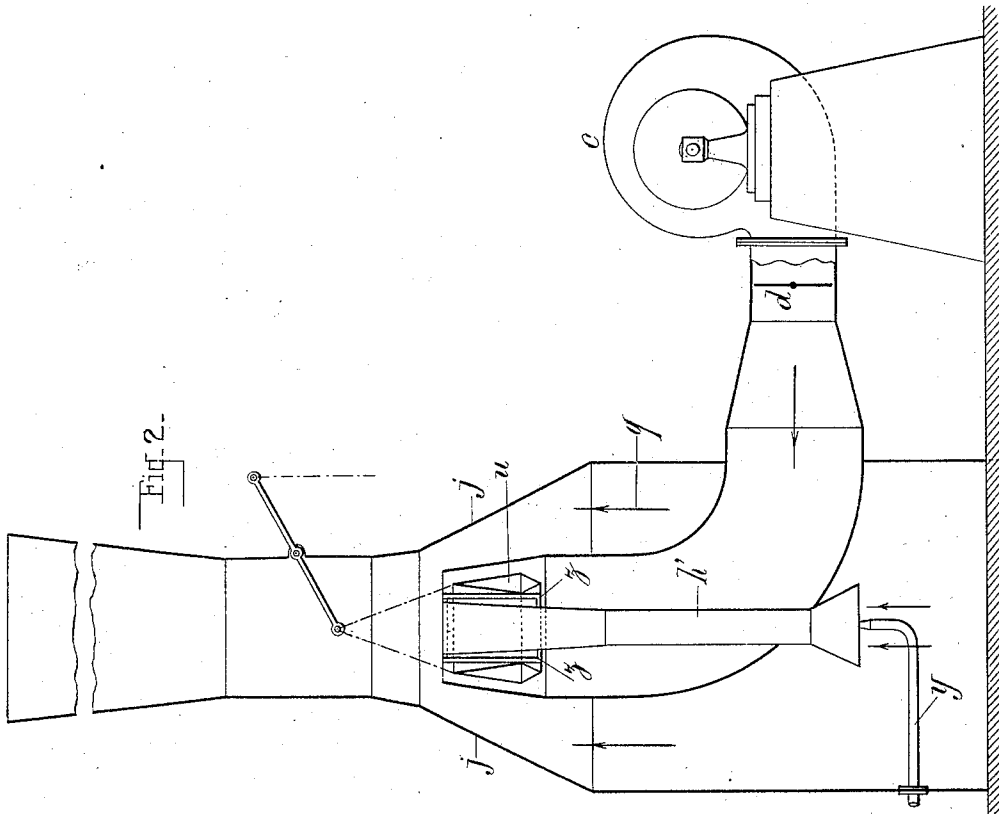


Fig. 2.



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# UNITED STATES PATENT OFFICE.

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MECHANICAL DEVICE FOR CREATING FORCED DRAFT.

1,058,385.

Specification of Letters Patent.

Patented Apr. 8, 1913.

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*To all whom it may concern:*

Be it known that I, JULES PRAT, a citizen of France, residing at Paris, France, have invented new and useful Improvements in Mechanical Devices for Creating a Forced Draft, (for which I have obtained a patent in France, No. 398,400, bearing date December 31, 1908; a patent of addition in France, No. 10,390, of January 26, 1909, and a patent in Canada, No. 118,525, granted May 25, 1909,) of which the following is a specification.

This invention relates to improvements in mechanical appliances for creating a forced draft, by means of a fan arranged external to the flue. According to these improvements, the air conduit from the fan terminates, at its upper end, in an annular orifice, which is formed by conical walls, and through which the motive air flows, while the gases to be carried off are led through a conical annular pipe, and through the central portion of the air conduit, by suitable communication. A straight tube, on which there can be fitted a safety ejecto-injector capable of working either by steam, or by compressed air may also be employed, further, the area of flow of the motive air is capable of reduction, at will, by utilizing, for this purpose, a suitably guided removable ring-obturator terminating, both at top and at bottom, on conical surfaces, permitting the flow of the thin fluid streams without contraction or eddy.

It is a well known construction to have according to the circumstances the gases drawn in pass around the air injection, if this injection be central, and pass into the interior of the air injection, if this latter be annular. In both cases, the expansion chamber situated above the zone of injection should be made of such a length as to give a good yield. But the experience shows that, notwithstanding the diverging tube surmounting the said chamber, the motive air maintains, at the outlet orifice, too great a speed in the center of the diverging tube, if the injection is central, or upon the walls of the said tube, if the injection is annular. This proves that the effect of the injection of air is not fully utilized. This inconven-

ience results from the insufficiency of contact between the motive air and the gases. On the one hand, in central injection, the central molecules of the jet, which travel with the greatest velocity, do not tend to approach those of the gas carried along; on the other hand, in annular injection, the same thing happens for the motive streams flowing along the wall. To obtain, therefore, the full effect of an injection of air, it is necessary to multiply the surfaces of contact, and it will be understood that this result would be attained if, in a nozzle, the motive air carried along in streams, could flow side by side through a number of smaller annular concentric orifices, or through a series of small twyers arranged close to each other. Practically, it is important not to divide up the stream into great number of parts, on account of the loss of pressure that such small nozzles would entail, and it is preferable to adopt the following arrangement.

The improved device, forming the object of the present invention, permits to obtain the full effect above specified.

Referring to the drawings: Figure 1 is a vertical sectional elevation of an improved device, according to the present invention. Figure 2 is a view showing a modification of the said device.

According to the arrangement shown in Fig. 1, the air tube *d* which forms a continuation of the fan, terminates, at its upper part, in an annular orifice formed by conical walls, *k* and *i*. Between these walls the motive air flows, while the gases, on which the air is to act, are brought at the same time through the conical twyer *j*, also annular, and through the central part *l*. The tube *d*, therefore takes the form of a central injector with an annular outlet, and the motive air is in contact with the gases drawn in both on the exterior and in the interior. To reduce the area of flow of the motive air, as required, without altering the yield of the apparatus, a ring-obturator *m*, *u* is used. In practice, it is well known that the fan is always actuated by means of a constant speed motor, although the draft required is only for a few boilers, instead

of for the full number for which the draft apparatus has been designed. It would seem, at first, that, in order to satisfy this change of working, it would suffice to actuate the damper placed in the air conduit. But, as a matter of fact, the yield of such a device is most defective, as it causes a considerable loss of pressure, when used to reduce the volume of air injected. Quite the contrary happens with the ring-obturator above specified, as it allows the giving of all possible values without causing this loss, by its simple vertical displacement along the annular walls of the twyer. As shown in Fig. 1, this ring-obturator, for working at full area, is located at the lower part of the twyer (shown in dotted lines). Its lower part presents a triangular form  $r, s, t$ , having an angle at the center of about  $30^\circ$ , so as to avoid all contraction of the air moving around it. Likewise, the upper part  $s, t, u$ , of this ring, is also of triangular form, with an angle at top of about  $7^\circ$ , so that the fluid streams, after having separated at the swell of the lower part, can come together again at the narrowed portion of the ring, that is to say at the orifice of the twyer, without contractions or eddy. The working of this obturator is therefore as follows: When the twyer works at full area, the obturator is lowered into its interior, so that its upper edge  $u, u$ , is flush with the twyer. But when it must work with a reduced charge, the obturator is raised the required extent, by any suitable mechanism, so as to cause, by its obstruction, the reduction in the area sought. Now, as it is generally only necessary to reduce by half the area of the twyer, whose edges are very near one another, the portion  $s, t$  of the ring is relatively narrow, so that its height  $r, u$  is itself not very high. It therefore results that the vertical stroke of the ring is very much reduced, which would not be the case with a simple cone obturator working in the same way in a twyer of solely central injection having the same section of flow. The consequence of this arrangement, therefore, is that the central annular injection above described presents, on the one hand, the advantage of multiplying the points of contact of the motive fluid and of the fluid carried off, and on the other hand, of allowing the reduction of its escape orifice by a ring-obturator having only a short stroke to traverse. By way of example, Fig. 1 shows how the control of this ring can be arranged, by means of a counter weighted lever, at the end of which is fixed a cord  $n$  winding around a wheel provided with a graduated dial  $o$  whose hand enables one to ascertain the position of the ring in the twyer, at the foot of the flue for instance. Any other mechanism may, however, be

used for the same purpose. This figure also shows that the ring-obturator is furnished with three or four projections  $v$  serving as guides on the straight portion of the twyer and allowing it to be always centered in the annular twyer at whatever height it may be.

It may be advisable, to provide an auxiliary device, in the case of the accidental stoppage of the fan; this auxiliary device includes a tube,  $h^1$ , through which a portion of the gases to be carried off can pass, the other portion escaping, as previously, through the conical twyer  $j$ ; the said tube  $h^1$  is combined with a suitable adjutage, as shown in Fig. 2, a jet of steam, or compressed air, issued through a suitable pipe  $y$ , entering in the said adjutage, which acts as an ejecto-injector. Under the influence of the jet above specified, a portion of the gases to be carried off, flows into the tube  $h^1$ , mixes with the motive fluid, and this mixture, escaping through the splayed orifice of the tube  $h^1$ , effects the carrying off, in the conical twyer  $j$ , of the remaining portion of the gases to be conveyed away. A ring-regulator  $u$  may be used in this modification, and rods  $z$  are then employed to guide the movements of the same.

Having now fully described and ascertained my said invention, and the manner in which it is to be performed, I declare that what I claim is:

1. An improved mechanical device for creating a forced draft, the said device including a conduit for the conveyance of the gases to be drawn off; a fan; an air conduit leading from the fan, said conduit being disposed in the axis of the gases' conduit, and being formed with an annular conical outlet orifice; an adjustable ring-obturator, formed with upper and lower conical surfaces, and disposed in the annular conical outlet orifice of the air conduit; means for adjusting the position of said obturator relatively to the outlet orifice; and a communication between the air conduit and the flow of the furnace gases, conveying some of the latter through the center of the outlet of the air conduit.

2. In an improved mechanical device for creating a forced draft, the said device including a conduit for the conveyance of the gases to be drawn off; a fan; an air conduit leading from the fan, said conduit being disposed in the axis of the gases' conduit, and being formed with an annular conical outlet orifice; an adjustable ring-obturator, formed with upper and lower conical surfaces, and disposed in the annular conical outlet orifice of the air conduit; means for adjusting the position of said obturator relatively to the outlet orifice; and a communication between the air conduit and the flow

of the furnace gases, conveying some of the  
latter through the center of the outlet of  
the air conduit; and an auxiliary injector,  
so located as to induce a draft through said  
5 communication.

name to this specification in the presence  
of two subscribing witnesses.

JULES PRAT.

Witnesses:

JULES FAYOLLET,  
EUGÈNE TICHON.

In testimony whereof, I have signed my

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,  
Washington, D. C."