

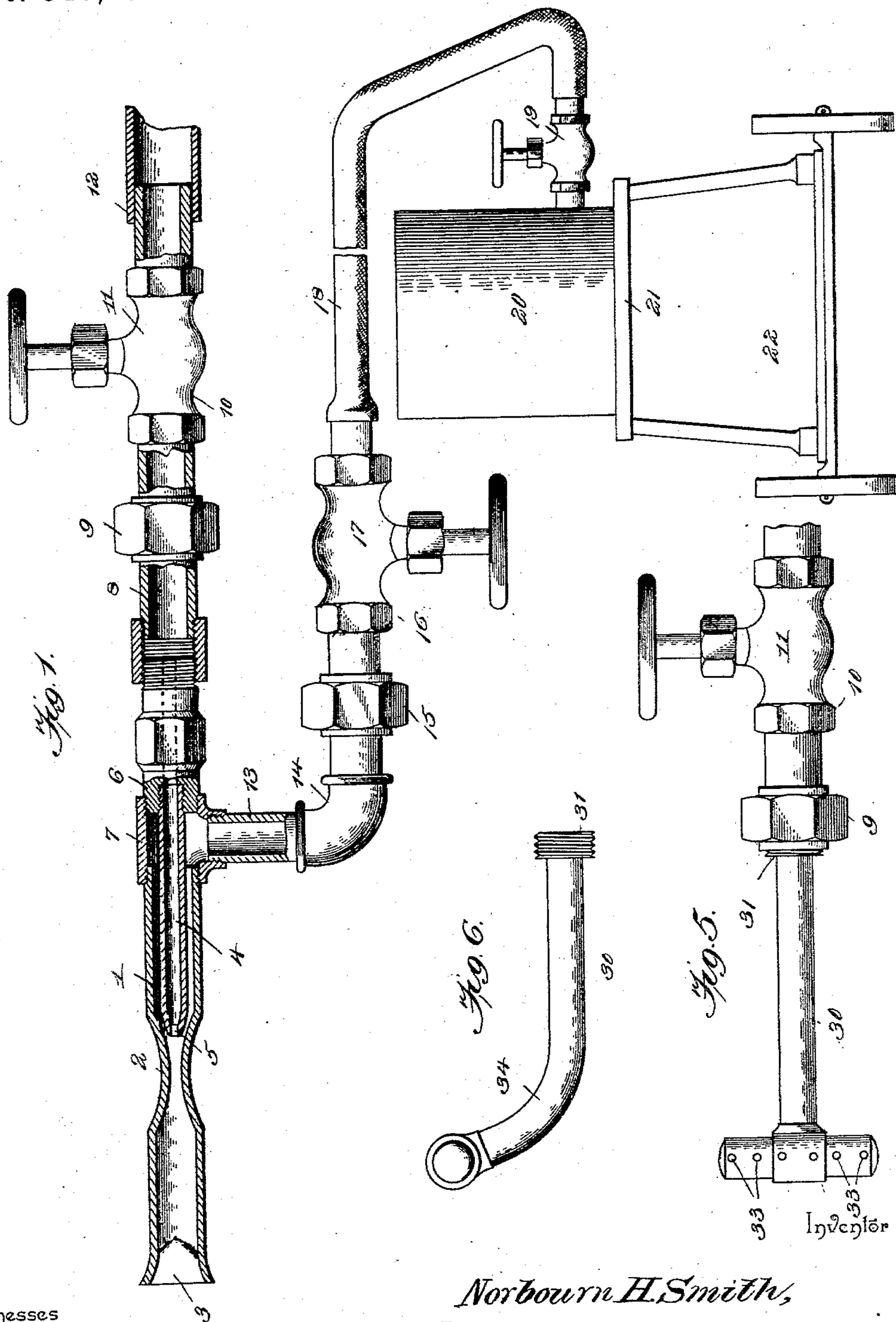
(No Model.)

2 Sheets—Sheet 1.

N. H. SMITH.  
VACUUM FIRE KINDLER.

No. 546,356.

Patented Sept. 17, 1895.



Witnesses

*John C. Shaw.*  
*D. P. McLaughlin.*

*Norbourn H. Smith,*

By *his* Attorneys.

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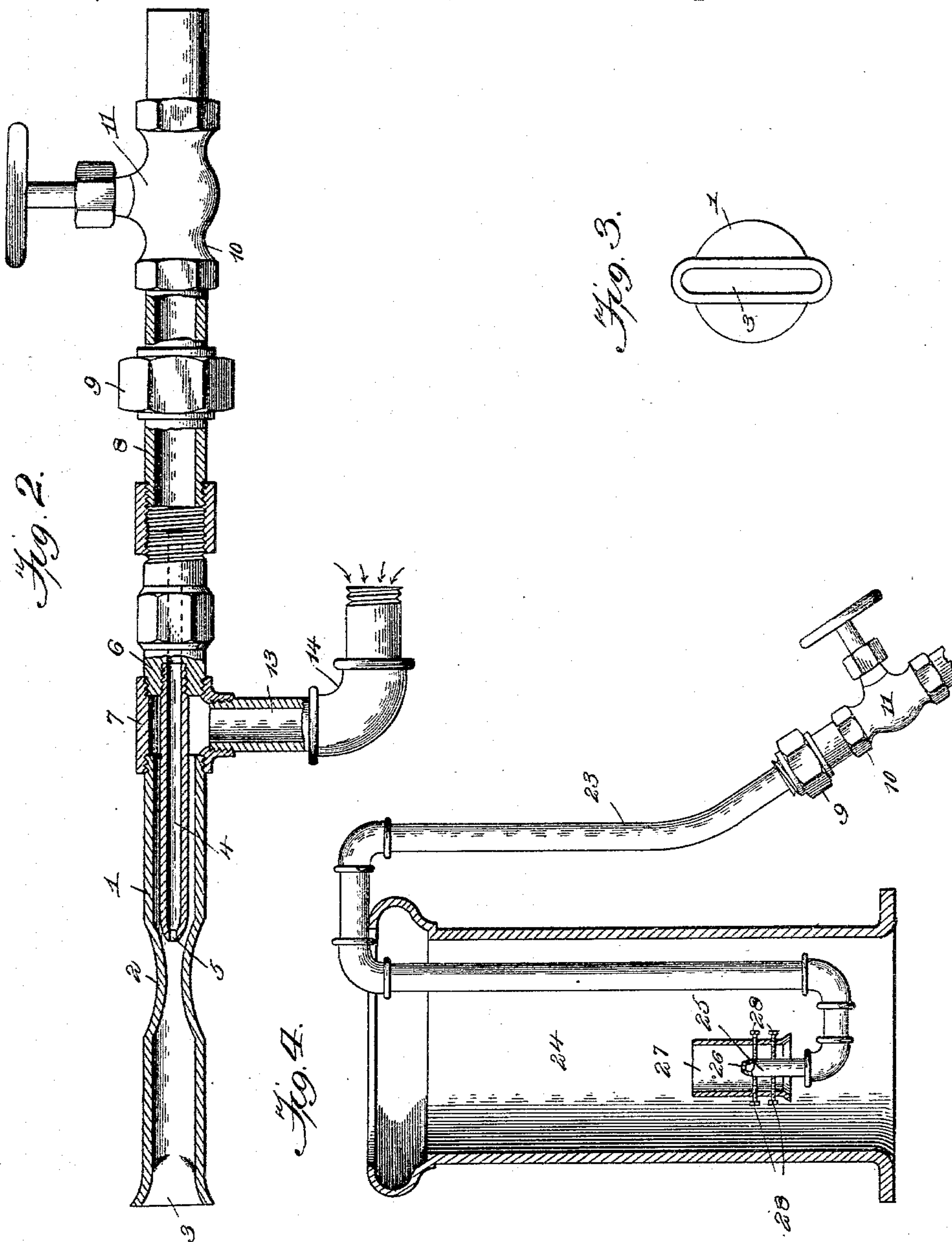
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Inventor

Norbourn H. Smith,

Witnesses

John C. Shaw.  
D. P. Walker.

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*C. A. Snow & Co.*



# UNITED STATES PATENT OFFICE.

NORBOURN HENRY SMITH, OF BRISTOL, TENNESSEE, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF THREE-FOURTHS TO JERE BUNTING, JR., LINDSAY BUNTING, THOMAS McCULLOCH, AND L. N. BUFORD, OF SAME PLACE.

## VACUUM FIRE-KINDLER.

SPECIFICATION forming part of Letters Patent No. 546,356, dated September 17, 1895.

Application filed October 25, 1894. Serial No. 526,972. (No model.)

*To all whom it may concern:*

Be it known that I, NORBOURN HENRY SMITH, a citizen of the United States, residing at Bristol, in the county of Sullivan and State of Tennessee, have invented a new and useful Vacuum Fire-Kindler, of which the following is a specification.

This invention relates to vacuum fire-kindling apparatus; and it has for its object to provide an apparatus of this character especially adapted for use to kindle the fires of locomotive-boilers without the use of wood.

To this end the main and primary object of the present invention is to construct a fire-kindling apparatus using a mixture of crude oil and air and having simple and efficient means for positively feeding and distributing a large quantity of thoroughly-mixed oil and air onto green coal in the fire-box of a locomotive, whereby the fire may be started very rapidly.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

In the drawings, Figure 1 is a side elevation, partly in section, of a vacuum fire-kindler constructed in accordance with this invention. Fig. 2 is a similar view showing the valve-coupling for the oil-hose disconnected from the feed-pipe to increase the volume of air forced into the fuel after the fire has been started. Fig. 3 is a detail end view of the vacuum mixing-pipe, showing the integral burner-mouth thereof. Fig. 4 is a detail elevation, partly in section, of the stack-blower attachment for the apparatus after the fire has been started. Fig. 5 is a detail elevation or plan view of the ash-pan blower attachment for the apparatus. Fig. 6 is a side view of the blower shown in Fig. 5.

Referring to the accompanying drawings, 1 designates a vacuum mixing pipe or casing provided at an intermediate point with a contracted mixing-throat 2, and at one end the said pipe 1 is narrowed to form an integral vertically-disposed oblong burner-mouth 3, at which point the mixture of air and crude

oil is ignited and discharged into the green fuel within the fire-box, it, of course, being understood that the pipe or casing 1 is adapted to be inserted into the fire-box of a locomotive-boiler to provide for directing the flame into the fuel for firing or kindling the same. By reason of providing the pipe or casing 1 at an intermediate point with the throat 2 and at one end with the contracted mouth 3 it will be observed that between the contracted points 2 and 3 is formed an enlarged mixing-chamber having straight walls and providing for the reception of the commingled air and oil to insure the complete mixing thereof before being discharged through the contracted mouth 3.

The vacuum mixing pipe or casing 1 is adapted to have arranged within one end thereof at one side of its intermediate contracted throat 2 a smaller air-jet pipe 4, the inner end of which pipe is perforated and contracted, as at 5, and disposed partly within the contracted throat portion 2 of the mixing pipe or casing, and the other opposite outer end of the small air-jet pipe 4 is fitted into one end of a reducing-plug 6, coupled onto the end of the pipe 1 opposite the burner-mouth 3 by means of a T-coupling 7. The reducing-plug 6 is of the same internal bore as the small pipe 4, and said plug 6 has coupled to the side opposite the T-coupling 7 one end of a larger main air-pipe 8, that serves to carry the air into the pipe 4, and by reason of the pipe 4 being of a smaller diameter than the main pipe 8 it will be obvious that the air is further condensed or concentrated within the pipe 4 and is discharged with great force through the jet-opening 5 of said pipe 4, thereby producing a very powerful suction within the mixing-pipe 1.

The large main air-pipe 8 is adapted to have detachably connected with one end thereof, by means of a union-coupling 9, a valve-coupling 10, having an ordinary globe-valve 11, and adapted to have connected therewith one end of a flexible air-hose 12, that connects with a suitably-located air-pipe that provides means for forcing air under pressure into the pipe 8 and through the smaller air-jet pipe 4, in order to maintain the necessary



suction within the pipe 1, and also to provide the necessary supply of air to be mixed with the oil.

The T-coupling 7, at one end of the pipe 1, has connected to its lower side the upper end of a depending feed-pipe 13, that is provided with an elbow 14, connecting the vertical and horizontal portions thereof, and the horizontal portion of said feed-pipe 13 is adapted to have detachably connected therewith, by means of a union-coupling 15, a valve-coupling 16, having an ordinary globe-valve 17, and adapted to have connected therewith one end of an oil-supply hose 18, the other end of which is preferably connected to the valved connection 19 at one side of an oil-tank 20, supported on an elevated platform 21 of a wheeled hand-truck 22, that can be conveniently moved from point to point when the apparatus is used to kindle the fires of different locomotives, and said truck, as illustrated in Fig. 1 of the drawings, may also form a convenient carrier for the hose part of the apparatus.

In operation, the concentrated jet of air that is discharged into the pipe 1 from the jet-pipe 4 produces a powerful vacuum within the said pipe 1, which vacuum produces a sufficient suction in the feed-pipe 13 to cause the oil to be fed by the vacuum alone into the pipe 1 and up to the throat 2, at which point the jet of air breaks up the oil into a spray and thoroughly commingles therewith before discharging out of the oblong burner-mouth 3 at one end of the pipe 1, where the intermingled air and oil is ignited for kindling the fire. As soon as the fire is started the oil-hose valve-coupling 17 is disconnected from the feed-pipe 13 by unscrewing the coupling 15, and by continuing the forcing of air through the jet-pipe 4 the feed-pipe 13 will act in the supplemental capacity of a supplemental air-feed pipe, through which air is drawn into the pipe 1, thereby providing an arrangement whereby an increased volume of air is directed onto the fire to produce a forced draft and to make the fire burn brightly to prevent the same from dying out after the supply of oil has been cut off, which is a very desirable feature in connection with kindling apparatus of this character.

To supplement the action of the apparatus already described after an increased volume of air has been forced into the fire, as referred to, the air-hose valve-coupling 11 is disconnected from the main air-pipe 8 by unscrewing the coupling 9, and said coupling 9 is then detachably connected to one end of an inverted-U-shaped stack blower-pipe 23. The inverted-U-shaped stack blower-pipe 23 is adapted to be placed on the upper edge of the locomotive-stack 24, as illustrated in Fig. 4 of the drawings, and as thus supported one depending side portion of the pipe 23 is arranged outside of the stack 24 for the coupling of the hose 12 therewith and the other side portion of said pipe extends down within

the stack and is provided with an offstanding upwardly-disposed jet-nipple 25, provided at its upper end with a small jet-opening 26, through which the air is forced. The said upwardly-disposed jet-nipple 25 is adapted to be arranged within a larger suction-sleeve 27, that is removably supported on the nipple 25 by means of a series of said screws 28, passed therethrough and impinging on the said nipple. The large suction-sleeve 27 is provided with a lower flared end 29, and is sufficiently large to allow a free circulation of air around the said nipple, so that when the air is forced out of said nipple a partial vacuum will be created within the sleeve 27, thereby producing a sufficient suction or draft within the stack to accelerate the natural draft of the fire, and complete the work of the apparatus by causing the fire to burn quickly and naturally after the main kindling operation.

At times it may be found necessary to supplement the operation of the apparatus when forcing an increased volume of air into the fire, as already described, and to make provision for this a T-shaped ash-pan blower-pipe 30 is employed. The T-shaped ash-pan blower-pipe is provided at one end with a threaded collar 31, adapted to be engaged by the union-nut 9 of the air-hose valve-coupling 10, and the cross-head portion of the pipe 30 is provided with a longitudinal series of jet holes or openings 33 in its upper side to provide for discharging a jet of air into the fire from under the grate, and the said pipe 30 is provided at the cross-head end thereof with an upwardly-disposed portion 34 that provides for positioning the cross-head portion of the pipe directly under and in close proximity to the grate of the fire-box.

From the above it is thought that the construction, operation, and many advantages of the herein-described apparatus will readily suggest themselves to those skilled in the art, and it will be understood that changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In an apparatus of the class described, an air-operated injector provided at one end with a combined oil or air feed pipe having a detachable connection with an oil tank or reservoir whereby either a supply of oil or air may be drawn through the feed pipe by the suction within the injector, substantially as set forth.

2. In a vacuum fire kindling apparatus, the combination of a cylindrical mixing pipe or casing provided at or about its center with an integral contracted throat and at one end beyond said throat with a narrow oblong mouth, said contracted throat and contracted mouth forming there-between an intermediate mixing chamber with straight walls, an air jet



pipe fitted within one end of the mixing pipe  
or casing and extending to a point partly  
within said contracted throat, and a combined  
oil or air feed pipe connected to the mixing  
5 pipe or casing at the same end as the connec-  
tion of the air jet pipe therewith, substan-  
tially as set forth.

In testimony that I claim the foregoing as  
my own I have hereto affixed my signature in  
the presence of two witnesses.

NORBOURN HENRY SMITH.

Witnesses:

L. N. BUFORD,

JOHN B. BAUMGARDNER.