J. E. CLARK.

PROCESS AND APPARATUS OF TREATING MATERIAL.

APPLICATION FILED MAY 16, 1916.

1,363,230. **Patented Dec. 28, 1920.**

2 SHEETS—SHEET 1.

Fig. 1.

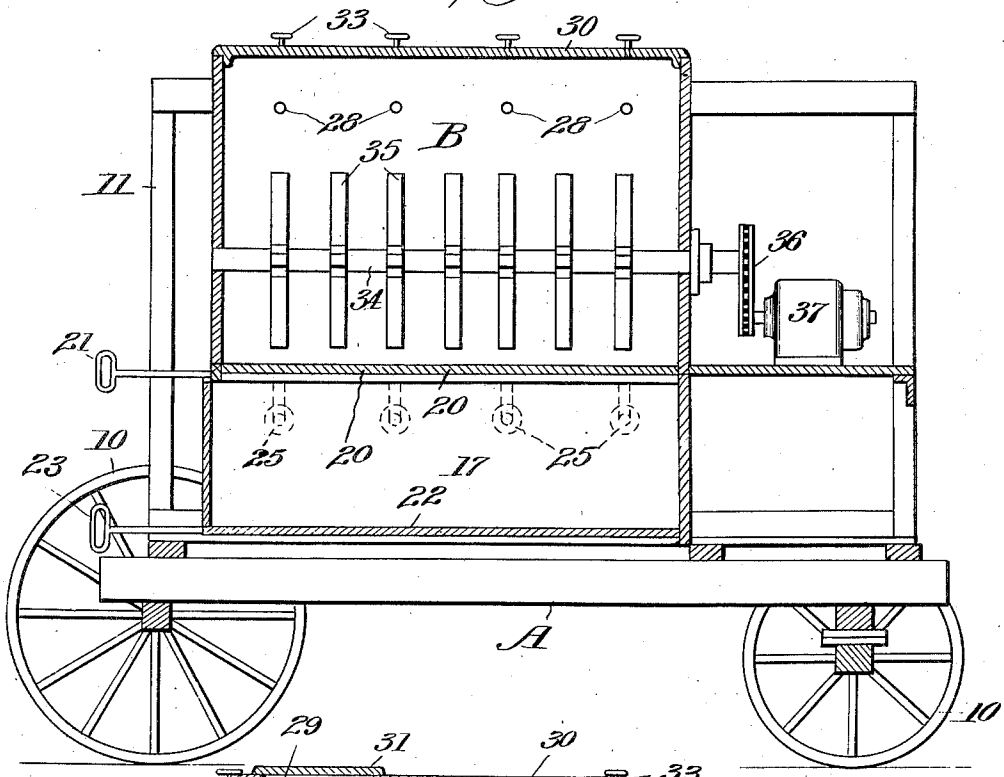
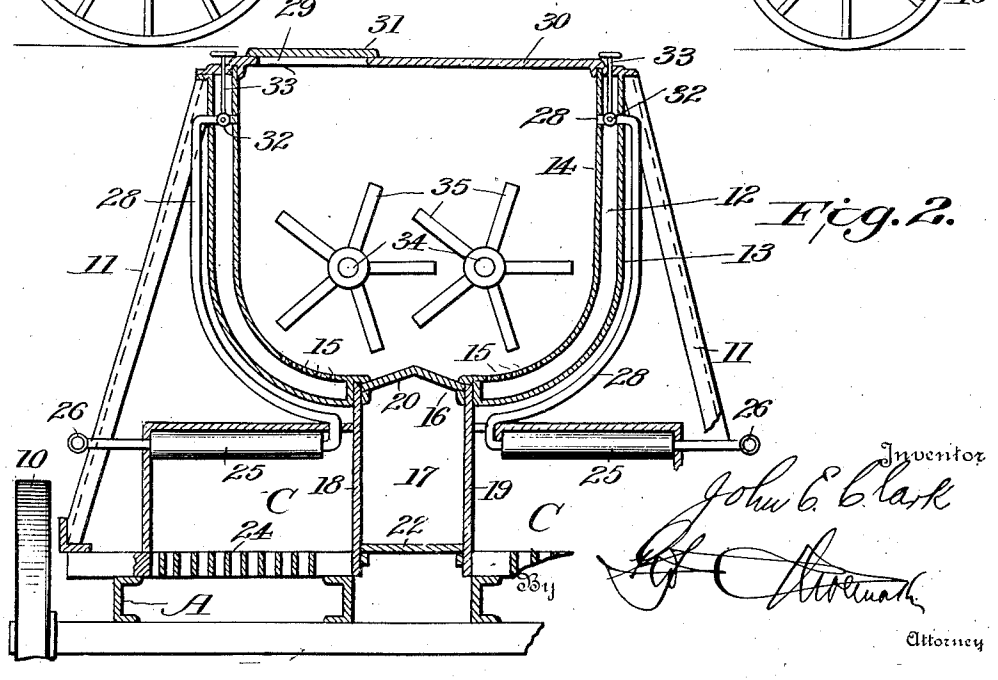


Fig. 2.



Inventor

John E. Clark

Attorney

J. E. CLARK.

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2 SHEETS—SHEET 2.

Fig. 4.

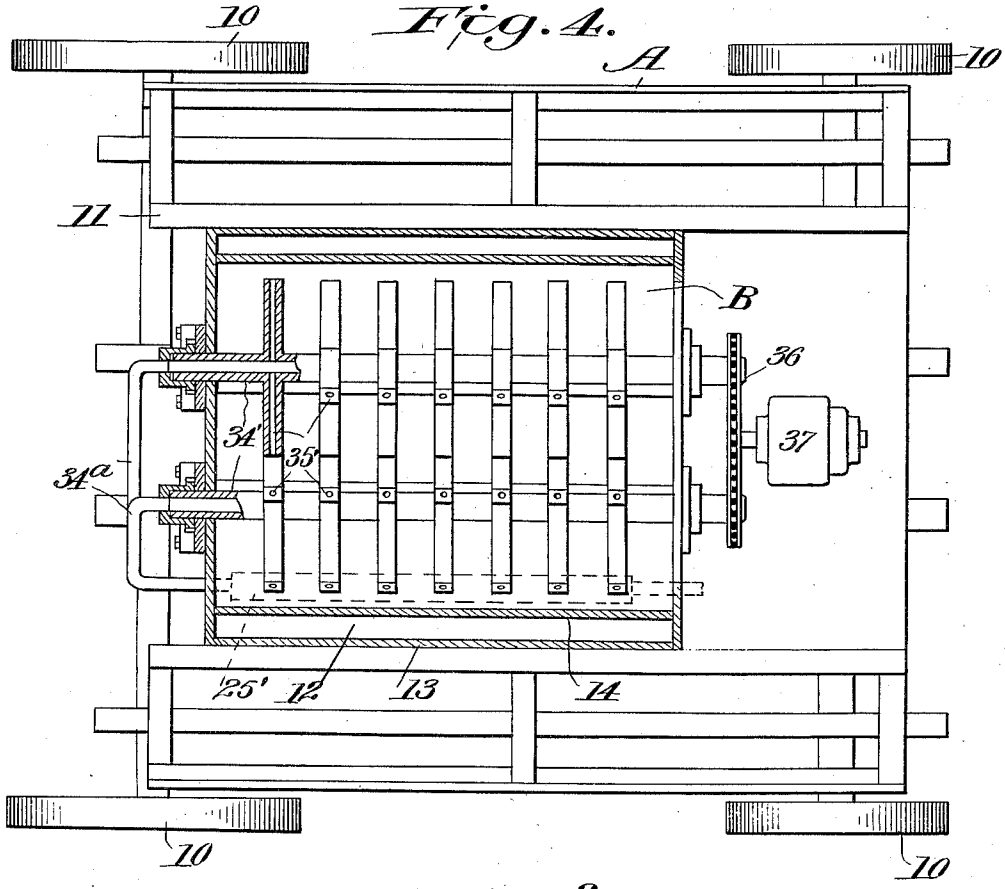
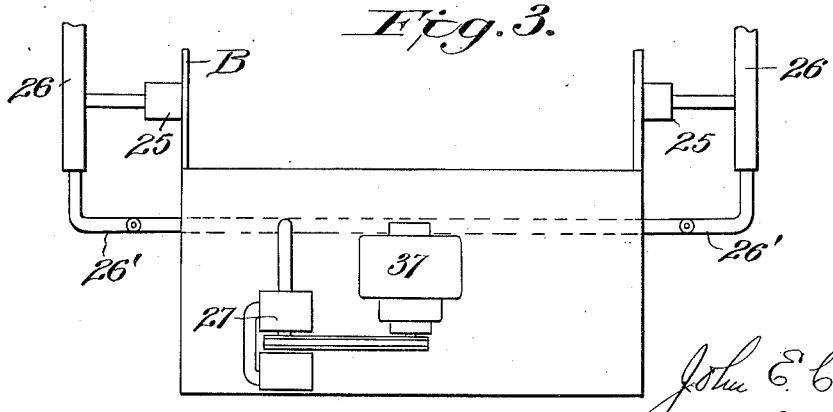


Fig. 3.



Inventor

John E. Clark

By

Attorney

UNITED STATES PATENT OFFICE.

JOHN EARNEST CLARK, OF TORONTO, ONTARIO, CANADA.

PROCESS AND APPARATUS OF TREATING MATERIAL.

1,363,230. Specification of Letters Patent. Patented Dec. 28, 1920.

Application filed May 16, 1916. Serial No. 97,934.

To all whom it may concern:

Be it known that I, JOHN E. CLARK, a citizen of the United States, residing at Toronto, in the Province of Ontario and Dominion of Canada, have invented certain new and useful Improvements in Processes and Apparatus of Treating Material, of which the following is a specification.

This invention relates to mixing machines.

One object is to provide a machine for mixing asphaltic fibrous, cementitious, earthy or mineral, or other materials alone or two or more together or compounded with bitumen or asphalt in an economical and convenient manner under the influence of heat maintained at a uniform temperature.

Another object is to provide a portable mixing machine particularly adapted for the mixing of paving materials in the presence of heat, such for instance, as fibrous material with bitumen or asphalt, or earthy or mineral material with bitumen or asphalt, or fibrous materials with earthy or mineral matter and bitumen or asphalt, embodying among other characteristics, means whereby the material may be discharged from the mixing vat onto the ground or discharged from the vat into a storage chamber arranged beneath the vat where it may remain indefinitely or from which it may be transported to another place and maintained at substantially the same temperature under which it was agitated in the mixing vat.

Another object resides in the provision of a mixing machine particularly adapted for mixing moist materials embodying a mixing vat in which the moist materials may be agitated and thoroughly commingled in the presence of heat and bitumen or asphalt and into which vat heated air may be forced to assist in facilitating the drying of the materials.

With the above and other objects in view, the present invention consists in the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that changes may be made in the form, proportion, size and minor details without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawings:—

Figure 1 is a vertical longitudinal sectional view of the invention.

Fig. 2 is a vertical transverse sectional view.

Fig. 3 is a top plan view.

Fig. 4 is a top plan view partly in horizontal section illustrating a modified form of the invention.

Referring now more particularly to the accompanying drawings, the reference character A indicates a hollow frame composed of any suitable material and of any suitable size and shape, preferably rectangular in formation, as shown, and, if desired, mounted in any preferred manner on suitable wheels 10 whereby the machine may be readily transported from one place to another.

A mixing vat B is supported on the wheeled supporting frame in any suitable manner as, for instance, by means of a suitable framework 11. This vat is relatively long and preferably double walled so as to provide air spaces 12.

The outer wall 13 of the vat may be formed of relatively heavy material while the inner wall 14 of the chamber is preferably constructed of light material, there being a plurality of perforations 15 formed in the inner wall of the vat adjacent opposite sides of the longitudinal discharge opening 16 formed throughout the length of the bottom of the vat, the perforations being formed for a purpose presently explained.

The vat B has communication with a storage chamber 17 through the aforesaid opening 16, the chamber 17 being formed by walls 18 and 19 depending from the bottom of the chamber and at their lower ends secured in any suitable manner to the framework A of the wheeled supporting means. The communication between the vat B and the storage chamber 17 may be opened and closed by a slide 20 provided with a suitable hand or other operating member 21. The bottom of the storage chamber 17 is closed by a slide 22 which is slidably mounted between the walls 18 and 19 and manipulated

for sliding movement through the instrumentality of a hand or other operating means 23. For instance, materials may be discharged from the mixing vat B through the opening 16 upon an outward pull on the slide 20 and discharged into the storage chamber 17 and transported from one place to another. If desired, both slides 20 and 22 may be pulled out and the material permitted to pass from the mixing vat B directly through the storage chamber 17 and through the framework A and onto the ground, or into a receptacle or conveyance (not shown) for the transportation of the material.

Located on the wheel supporting means are furnaces C arranged preferably on opposite sides of the storage chamber 17 beneath the chamber B. Each furnace has a grate 24 and access may be had to each furnace in any suitable manner, the construction of the furnace being immaterial so long as it is capable of heating the material in the vat B and in the chamber 17 and maintaining the materials therein at a uniform temperature, it being one of the objects of the invention to maintain the material carried in the receptacle 17 at the same uniform temperature it had when in the vat B.

Cylinders 25 are supported in the upper portion of each furnace C to receive air let into them through header pipes 26 leading by pipe connections 26′ from a pump 27. This pump may be of any suitable character designed for forcing the air under pressure into the cylinders 25 and may be located on the wheeled supporting means or remote from it. Each cylinder 25 has a pipe 28 leading from its inner end upwardly along the outside of the outer wall 13 of the mixing vat and has its upper end directed through the outer wall 13 and fitted in the inner wall 14 of the mixing vat so that the air under pressure heated in the cylinders 25 by the respective furnaces may be forced through the pipes 28 into the vat at the top thereof for the purpose of facilitating drying out the moisture in the moist material and for the purpose of expediting the drying out process and for forcing the moisture out of the mixing vat B through the opening 29 in the top 30 of the vat and which opening 29 may be closed by closure 31, if desired, to heat the interior of the vat.

Located in the air spaces 12 between the outer and inner walls 13 and 14, respectively, of the mixing vat B and disposed in the line of each of the aforesaid pipes 28 is a valve 32 having a valve stem 33 accessible for manipulation to operate the valves 32 so that all of the heated air from the cylinders 25 may be directed into the mixing chamber at the upper portion thereof or so that all of the heated air from the cylinders 25 may be directed into the air spaces 12 and permitted to enter the mixing vat B at the bottom thereof through the aforesaid apertures 15, and thereby be forced upwardly through the mass; or, if desired, the valves 32 may be so manipulated that the air under pressure may be divided, whereby a portion of the air under pressure may be directed into the vat B at the upper portion thereof and a portion permitted to enter the air spaces 12 and enter the vat B at the bottom thereof through said apertures 15.

As has been stated, one of the objects of the present invention is to mix materials for paving purposes. In practice, I may mix moist fibrous materials with bitumen or asphalt. I contemplate also the mixing of moist mineral matter with moist fibrous material and bitumen or asphalt. I contemplate also the mixing of moist clay with or without lime mixed therewith and bitumen or asphalt, as well as the mixing of moist clay with or without lime, and moist sand with bitumen or asphalt, as well as the mixing of all of these materials, mixing the same in the presence of heat applied exteriorly to the mixing vat B through the instrumentality of said furnaces and to facilitate the drying out of the materials by the injection of heated air under pressure into the mixing vat. I contemplate also thoroughly agitating the materials during the process of mixing and this agitation may be accomplished in various ways. One way is to journal a pair of shafts 34 in the ends of the mixing vat B and to mount on these shafts within the vat B suitable agitators 35, the shafts at one end of the vat extending through the same and provided with gears 36 driven through the instrumentality of a suitable motor 37 mounted on the wheeled supporting means.

Assuming that it is desired to mix moist fibrous material with bitumen or asphalt, the fibrous material in its natural moist condition is subjected to hot bitumen at a desired degree of fluidity in the mixing vat B and agitated therein a predetermined time by the agitators 35. This fibrous material and the bitumen or asphalt may be placed in the mixing chamber B through the long opening 29 normally closed by the long closure 31. Before the bitumen or asphalt is placed in the vat B, the furnaces C are put into operation to heat the vat so that the temperature of the bitumen or asphalt may be maintained at the proper temperature.

I first place the damp or moist material in the vat and close the door 31. I then subject the moist material to the action of the hot air under pressure to warm the same, keeping the door 31 closed to prevent drying of the material. At a predetermined time I open the door 31 and introduce the desired amount of hot bitumen or asphalt and leave the door open to permit the escape of steam generated by the mixing of the hot bitumen

or asphalt with the moist material. The material before or after the introduction of the air or bitumen or both, may be agitated to effect a thorough mixing of the contents of the vat.

After the material has been thus treated, the slide 20 may be pulled out to permit the mixed material to drop into the storage chamber 17 in which it is maintained at a uniform temperature by virtue of the disposition of said storage chamber between the furnaces C and be ready for use when needed; or, if desired, both slides 20 and 22 may be pulled out and the material permitted to drop from the mixing vat B entirely through the storage chamber 17 onto the ground for immediate use. The material is preferably laid for paving purposes before it cools and while still hot, it is subjected to pressure by rolling or otherwise. The result is an economical pavement possessing long life, sanitary and other valuable qualities.

The same process of treating the material is again gone through with in the mixing of moist sand with bitumen or asphalt, the only difference being that the sand does not necessarily become impregnated, although the bitumen or asphalt forms an effective binder. The same process is gone through with in the mixing of moist fibrous matter and moist sand with the bitumen or asphalt, as well as when moist clay alone or with lime or with fibrous or other materials is subjected to the action of heated bitumen or asphalt.

No matter what material or materials may be employed as a body, the same is preferably moist and, if it is not sufficiently moist in its natural state, the same may be dampened with water. I find that by the use of moist material instead of material that has been previously dried, that I am enabled to obtain a better impregnation in materials capable of becoming impregnated and that I provide for a more effective binding of the materials together whether the material is such as to become impregnated or not.

The materials thus treated may be used for roofing, flooring, railroad ties or other usages as well as for paving purposes. However, the machine is particularly adapted for use in laying pavements as the materials may be mixed and prepared for use at any point along the road, obviating the necessity of hauling the treated material from a distant plant, and also obviating the use of the ordinary drying apparatus.

In Fig. 4 there is illustrated a modified form of the invention. In this modification the shafts 34′ and the bolts 35′ may be hollow and the pipes 34ª which convey the compressed air from one or more heating chambers 25′ located in one or both of the furnaces are connected to the ends of the hollow shafts, whereby the contents of the vat may be subjected to the action of heated air under pressure. The arrangement for heating the air may be varied and the connection of both of the hollow shafts in Fig. 4 with two tubes leading to one air heating chamber 25′ is merely to disclose one embodiment of the present invention.

What I claim is:

1. A machine of the character described comprising a wheeled supporting means, a vat fixedly mounted on the wheeled supporting means, agitating means arranged within the vat, means for driving the agitating means, a furnace arranged beneath the vat, air chambers interposed in the upper part of the furnace and arranged between the furnace and the vat, and means for conducting air under pressure from the chambers to the vat.

2. A machine of the character described comprising a wheeled supporting means, a vat mounted on said supporting means, the vat being double walled to provide an air space between the walls of the vat, the inner wall of the vat having apertures therein to establish communication between the air space and the vat, and means for introducing heated air under pressure into said air space and into the vat through the apertures formed in the inner wall of the vat.

3. A mixing machine comprising a wheeled supporting means, a vat mounted on said supporting means, said vat including double walls forming an air space therebetween, a furnace mounted beneath the vat, air chambers arranged above the furnace, means for conducting heated air from said chambers to the space between the walls of the vat, and means for introducing the heated air under pressure into the vat at different points.

4. In a mixing machine, a mixing vat, means for heating the material in the vat, means for subjecting the material in the vat to heated air under pressure, a storage chamber beneath the vat, a furnace mounted beneath the vat on opposite sides of said storage chamber, and a slide between the vat and the storage chamber to open and close the communication between the vat and the chamber.

5. In a mixing machine, a wheeled supporting means, a mixing vat mounted on the supporting means, means to heat the contents of the vat, means in the vat to agitate the material therein, means for operating the agitating means, means for subjecting the material in the vat to heated air under pressure, a storage chamber mounted beneath the vat for communication with the latter, and means to open and close the communication between the vat and the chamber.

6. In a mixing machine, a wheeled supporting means, a mixing vat mounted on the

supporting means, means to heat the contents of the vat, means in the vat to agitate the material therein, means for operating the agitating means, means for subjecting the material in the vat to heated air under pressure, a storage chamber mounted beneath the vat for communication with the latter, and means to open and close the communication between the vat and the chamber, and a slide operable in the bottom of the storage chamber so that the contents of the latter may be retained temporarily therein or discharged therefrom through the bottom thereof.

7. A machine of the character described comprising a wheeled supporting means, a vat mounted on the wheeled supporting means, agitating means in the vat, means for operating the agitating means, means supported on the aforesaid supporting means fixed therein immediately beneath said vat, air chambers fixedly carried by the wheeled supporting means and arranged between the furnace and the vat and heated by the combustion from said furnace, and means for conducting air under pressure from said chamber to the vat.

8. A machine of the character described comprising a supporting means, a vat on said supporting means, a heating means, air compressing means, means for subjecting the material in the vat to the action of the compressed air under pressure in a heated condition, a storage chamber beneath the vat and having communication with the vat, and means whereby the communication between the vat and chamber may be operated so that the mixed material in the vat may be discharged from the latter into said storage chamber, the latter being disposed within said heating means whereby the walls of the storage chamber are maintained at substantially the same temperature as the walls of the vat, so that the material discharged into the storage chamber may be maintained at substantially the same uniform temperature as when it first entered the chamber.

9. A machine of the character described comprising a supporting means, a vat mounted on the supporting means, a heating means, air compressing means, a plurality of hollow shafts rotatably mounted in the vat, hollow perforated blades mounted on said shafts and communicating with the interior thereof, means for supplying heated air under pressure to said shafts, the air being forced through the apertures in the blades into the receptacle to facilitate drying of the materials being heated therein and supporting means for supplying air to the interior of vat.

In testimony whereof I affix my signature in the presence of two witnesses.

JOHN EARNEST CLARK.

Witnesses:
C. A. DETLER,
FANNIE E. HARTLEY.