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FLUE CUTTING, CLEANING, AND WELDING MACHINE.

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The object of this invention is to provide a machine for removing scale from the outside of boiler flues, which preferably will feed the flue automatically and may also be easily converted into a flue cutting or a flue welding machine.

Briefly the invention consists in a hollow support for receiving a flue upon which a rotary driving member is mounted, this member operating the cleaning, cutting and welding means. The cleaning means preferably is in the form of threaded rolls adjustable to set the threads at an angle to the axis of the flue for automatically feeding the same. Guiding and supporting means for the ends of the flue are provided, and said means at the trailing end are automatically releasable as the end of the flue passes to the cleaners. A mandrel is provided which may be positioned within the flue for any or all of the operations as desired or as may be necessary.

In the accompanying drawings wherein certain embodiments of the invention are disclosed,—

Fig. 1 is a view largely in elevation, but with parts broken away, showing the invention in its preferred form;

Fig. 2 is a detail in plan of the cleaning elements as indicated by line 2—2 of Fig. 1;

Fig. 2^a is a sectional detail thereof;

Fig. 3 is a fragmentary plan taken from line 3—3 of Fig. 1;

Fig. 4 is a cross section on line 4—4 of Fig. 1;

Fig. 5 is a perspective view of a form showing the cleaning, cutting and welding rolls assembled as an adjustable unit;

Fig. 6 is a view chiefly in vertical section showing some of the parts of Fig. 1 and indicating how the mandrel is ordinarily employed;

Fig. 7 is a sectional detail showing a mandrel which may be used when very short lengths are being handled.

Fig. 8 is a detail of a roller mounting which may be used with the rollers of Fig. 5.

A base or main support 10 is employed which has a head or bearing 12 in which is mounted a hollow tool support or sleeve 14. The outer end of support 14 has a pulley 15 journaled thereon which may be driven by a belt 116, while the other end adjacent the head 12 carries a slidable and rotatable collar 16 which may be positively reciprocated by means of a yoke 18 or the like. Upon the spokes 20 of the pulley 15 a plurality of arms

22 are pivoted at 23, one end of each arm being connected with the collar 16 by a link 24 in toggle formation. Adjacent the connection between each arm 22 and its link 24, a weight 25 may be mounted, its position being adjustable by reason of a plurality of holes 26 in the arms for receiving the securing pins. The outer ends of the arms 22 carry heads 30 and, as shown in Fig. 1, cleaning rolls 40. In this manner the weights 25 function after the fashion of a governor when pulley 15 is rotating, causing the rolls 40 to bear upon the flue F with increasing pressure as the speed of the pulley increases, the pressure thus being automatically variable, while manual control may be had through manipulation of the yoke 18.

The heads 30 are preferably removably mounted on the ends of arms 22 and are retained as by means of nuts 31. Each head is provided with a radially extending partially cylindrical socket 32 which receives a partially cylindrical tongue 33 in sliding relation, thus forming a sort of dove-tail joint which has sufficient play to permit variation of the angle of the plate 34 on tongue 33 with respect to the axis of the flue F and the support 14. This adjustment is secured by means of a pair of set screws 35 in the plate 34 bearing against head 30 on opposite sides of socket 32, while radial adjustment is maintained by a set screw in head 30 engaging with tongue 33. The lower end of head plate 30 carries a body or base 38 having trunnions 39 upon which rolls 40 are mounted. Rolls 40 have a plurality of threads 42 and these threads are preferably parallel forming a corrugated surface on the roll. By adjustment of plate 34 with screws 35 the angularity of the threads 42 with relation to the axis of the flue may be varied, and these threads will thus cause the flue to feed through support 14 as may be desired. The pressure will also cause the scale to be chipped off the surface of the flue.

In order to support and position the ends of the flue F, tracks in the form of channel irons 45 mounted upon legs 46 are placed at the opposite ends of the cleaning mechanism, and these channel irons receive the wheels 48 of a carriage 50. Each carriage is provided with a stationary flue gripping jaw 52 and a standard 54 to the upper end of which there is pivoted at 55 an arm 56 provided with a movable jaw 58 and a counterweight 60. An upstanding rod 62 pivoted on the

carriage is adapted to enter a slot in the end of arm 56 and has pivoted thereon at 63 a trigger 64 which is forked adjacent said pivot to rest upon the sides of arm 56 adjacent the slot when in upright or engaging position for causing the jaws to engage the flue F. Adjacent that end of the track next to the feed side of the machine, a frame 65 is provided which carries a trip bar 66 in the path of the upper end of trigger 64, whereby as the pipe end is fed to the machine the trip bar 66 throws the trigger over to release arm 56 and permit counterweight 60 to withdraw jaw 58 of the respective carriage.

Upon said track closely adjacent the cleaning elements a pair of concave guiding rollers 70 are mounted upon supporting arms 72, whereby accurate feeding of the flue to the cleaners is assured.

When a flue is to be cleaned, the tongues 33 are adjusted in heads 30 in accordance with the diameter of the flue, and the angularity of the threads of the rolls 40 is determined for the feed desired. Rotation of pulley 15 causes rotation of the cleaners and centrifugal force acting upon weights 25 causes pressure upon the flue to increase with increase in speed of rotation, the pressure of the threads resulting in chipping off the scale and the angularity of the threads producing feed of the flue through the machine. The carriages 50 support the ends of the flue and travel along the tracks formed by the channel irons 45, the concave rollers 70 guiding the flue accurately to the cleaners, and the trip 66 releasing the jaws 52, 58 from the trailing end of the flue as it it about to pass to the cleaners. Thus the flue passes automatically through the machine and is automatically cleaned. Obviously, the pulley 15 may be gear driven as by a motor, instead of belt driven as shown.

In Fig. 6 the machine is shown equipped with a mandrel 76 which is omitted from Fig. 1 but may be used wherever desired. Said mandrel is carried on a long rod whose opposite end is mounted on a base beyond the end of the flue. If necessary the mandrel may be used with the cleaning rolls, in which case the rod 78 will extend into the flue and the base 80 will be positioned adjacent the end of the respective track 45. However in said Fig. 6 the arms 20 are shown equipped with welding rollers 75 for producing a weld joint between the flue section F and the flue section F'. Thus the device may be used for reclaiming flues, that is using sections of broken flues by welding them together in proper lengths. The hollow support or sleeve 14 and the elongated mandrel-bearing rod 78 permit the handling of long flues or flue sections. Whatever the character of the rolls used, the device of this Fig. 6 operates as does that of Fig. 1.

Fig. 7 shows a form for welding very

short flue sections F'' to a flue F. In this form the mandrel 82, which is positioned within the flues under the scarfed joint 83 to be welded, is held within the sleeve 14 by means of a head or core secured to the sleeve, 70 the flue section lying within the sleeve. The mandrel and its head are removably mounted for ready withdrawal, said head being indicated at 84.

For flue cutting, one or more of the 75 smooth faced welding rolls 75 of Fig. 6 may be replaced by a cutting roll such as seen at 85 in Fig. 5.

In its most comprehensive form, each of the arms 22 of the form of Figs. 1 and 6 carries cleaning, welding and cutting rolls. Such a form is indicated in Fig. 5, where the arm 22 carries a spider 90 mounted upon a triangular shouldered section 92 of the arm, the tip of the arm being threaded at 93 to receive a spider-retaining nut not shown. The arms of the spider respectively carry bearings 94 upon which are mounted one of the threaded cleaning rolls 40, a smooth faced welding roll 75 and a cutting roll 85 having a cutting rib or the like 86. By removing the spider 90 from each arm 22 and adjusting to desired positions, the machine may be quickly set for cleaning, welding or cutting as desired. Obviously the shaft or bearing 94 for the cleaning rolls 40 may be adjustably or fixedly positioned upon the spider 90 for the purpose of setting the roll at the angle desired for proper feeding and cleaning of the flue. It is also obvious that the radial adjustment shown in Figs. 1, 2 and 6 at 32, 33, 35, may be employed for mounting the various rolls on the arms of the spider 90, but this construction is not indicated in Fig. 5 to avoid confusion in the showing.

The adjustable roll-mounting of Figs. 1, 2 and 2^a may include a feature for automatic adjustment of the roll trunnions 39, this feature being shown in Fig. 2^a. Here the shaft 139 which carries the trunnions 39 is mounted in a slot extending radially outward from the bottom of the head 38, this shaft being adapted to rock upon a fulcruming shoulder 43 on the head within the slot, and being held against displacement from the slot as by means of a set screw 44 or the like. Thus one roll may move inward slightly with corresponding outward movement of the other in order to insure equal pressure of the rolls upon the flue.

From the foregoing it will be clear that the present invention provides means for quickly and efficiently cleaning long flues of various diameters and simultaneously feeding the flue through the machine as it is cleaned, means being provided for properly positioning and guiding the flue. At the same time a long flue may be successfully handled and a mandrel may be used therein

if desired. Also, simple adjustments convert the device into a welding or a cutting machine and then back to a cleaning machine as may be required. This saves time and materially reduces the amount of equipment needed in the shop.

In Fig. 8 there is shown in transverse section a detail of a roller mounting which may be used with the cleaning rollers 40 of Fig. 5 for placing the axis of each roller at an angle to the axis of flue F. This consists in a bearing or bushing 95 having a bore at an angle to its axis for receiving the shaft 94 which is carried on spider 90. The roller 40 has a large bore which receives the bushing 95 for rotation of the roller upon the bushing. Thus the desired angularity of the roller is obtained.

I claim:

1. In combination, a hollow support adapted to receive therein a flue or the like, flue-treating members for engaging the flue, means for bodily rotating said members relatively to the flue for acting upon the latter, and means for automatically increasing the pressure of the members with increase of speed of rotation during operation.

2. In combination, a hollow support adapted to receive therein a flue or the like, cleaning members for engaging the flue, means for bodily rotating said members relatively to the flue, and means for automatically varying the pressure of said members upon the flue with variation of speed of rotation during the cleaning operation.

3. In combination, a stationary hollow support adapted to receive a flue therein, a driving member rotatable about the axis thereof, cleaning members carried upon and operated by said driving member, said cleaning members being adapted to engage the flue for cleaning the latter and also adapted to feed the flue through the support when in operation.

4. In combination, a stationary hollow support adapted to receive a flue therein, a driving member rotatable about the axis thereof, and threaded cleaning rolls operated by said member and adapted to engage the flue to clean the same, the threads being set at an angle to the axis of the flue for feeding the latter through said support.

5. In combination, a stationary hollow support adapted to receive a flue therein, a driving member rotatable about the axis thereof, and threaded cleaning rolls carried upon said member and adapted to engage and rotate around said flue, the threads of the rolls being set at an angle to the axis of the flue for feeding the latter.

6. In combination, a support, a driving member adapted for passage of a flue therethrough along its axis, and cleaning members operable by the driving member and adapted to engage the flue, said members

being adjustable radially and to vary their angle with respect to said axis.

7. In combination, a support, a driving member adapted for passage of a flue therethrough along its axis, and threaded cleaning rolls operable by said member and adapted to engage the flue, said rolls being adjustable to vary the set of the threads with respect to said axis, whereby said threads may feed the flue at different rates.

8. In combination, a support, a driving member thereon adapted for passage of a flue therethrough, flue treating means driven by said member, and guiding and supporting means on opposite sides of said support for the ends of a flue, one of said supporting means being automatically releasable as the flue is fed.

9. In combination, a support, a driving member thereon adapted for passage of a flue therethrough, a flue treating means driven by said member and adapted to feed the flue, and guiding and supporting means for the ends of the flue, the means at one end of the flue being automatically releasable as the flue is fed.

10. In combination, a support, a driving member thereon adapted for the passage of a flue therethrough, a flue treating means driven by said member and adapted to feed a flue, carriage means having flue gripping means for the opposite ends of the flue, guiding means for said carriage means, and means for automatically releasing the gripping means for one end of the flue as the flue is fed.

11. In combination, a support, driving means thereon, flue cleaning means, flue welding means and flue cutting means adapted to be brought selectively into working position and operable by said driving means.

12. In combination, a support, driving means thereon, and flue cleaning means and flue cutting means adapted to be brought selectively into working position and operable by said driving means.

13. In combination, a support, driving means thereon, and flue cleaning means and flue welding means adapted to be brought selectively into working position and operable by said driving means.

14. In combination, a support, a driving member thereon adapted for the passage of a flue therethrough, and flue cleaning, flue cutting and flue welding means adapted to be brought selectively into working position and operable by said driving means.

15. In combination, a support, driving means thereon adapted for the passage of a flue therethrough, and flue cleaning means, flue cutting means and flue welding means adapted to be brought selectively into working position and carried upon and operable by said driving means.

16. In combination, a support, a driving

member thereon adapted for the passage of a flue therethrough, and flue cleaning and flue cutting means adapted to be brought selectively into working position and carried by said driving member. 5

17. In combination, a support, driving means thereon adapted for the passage of a flue therethrough, and adjustably mounted flue cleaning, flue cutting and flue welding means adapted to be brought selectively into working position and carried by said driving means and operable thereby. 10

In testimony whereof I affix my signature.

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