

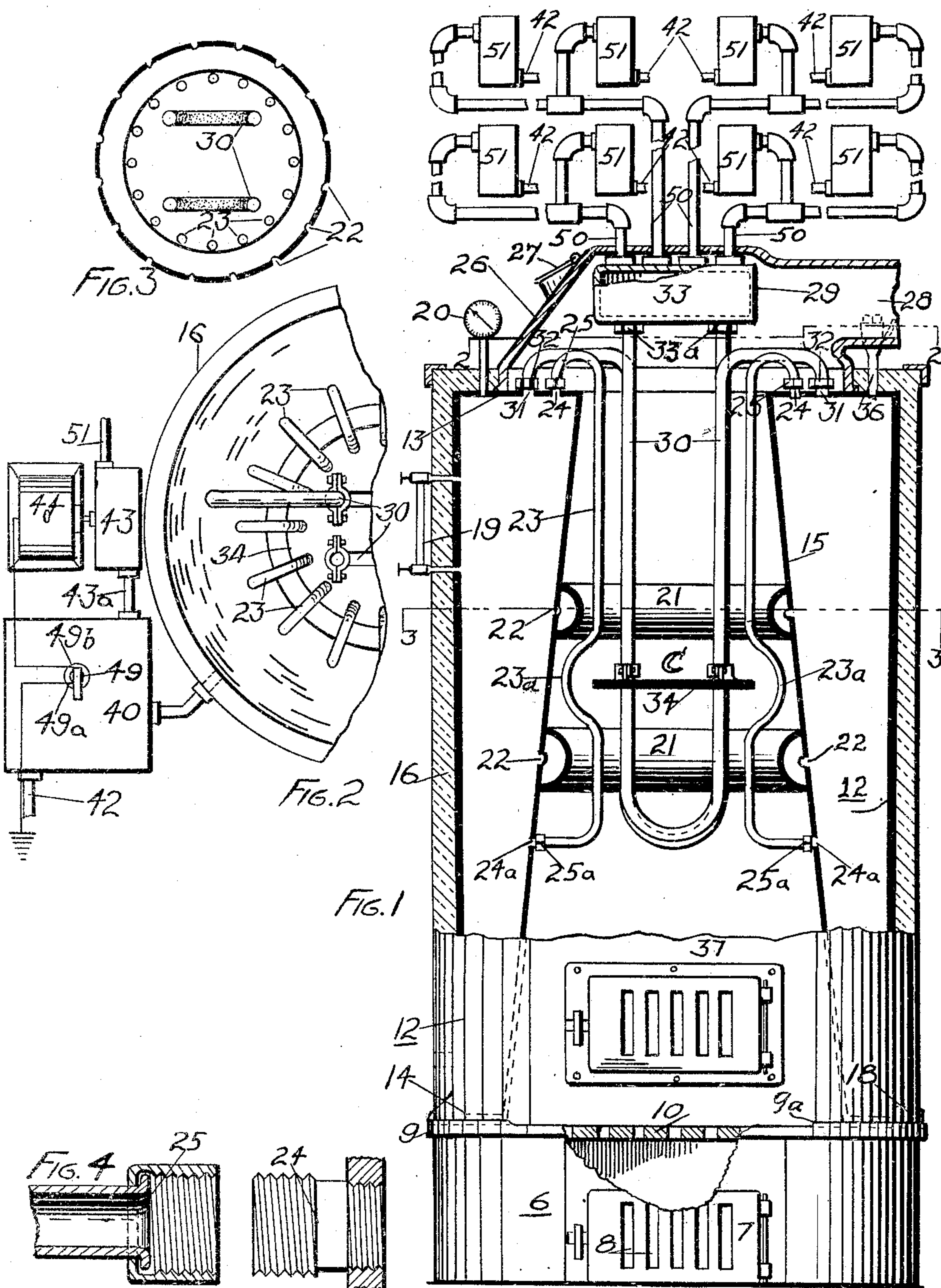
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HEATING BOILER

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WITNESSES
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HEATING BOILER

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The invention relates to improvements in heating boilers adapted to heat water for hot water equipments or to generate steam for steam apparatus. The purpose of the invention is to provide a heater adapted to heat water quickly and also adapted to generate rapidly a constant supply of steam; another purpose is to provide a heating boiler which may be manufactured at reasonable cost and sold at a reasonable price; and to provide other new and useful features of construction as will hereinafter appear.

With these objects in view my invention consists in the novel features of construction and combination of parts shown in the accompanying drawings to which reference is hereby made.

I will now describe the construction of my improved heating boiler and will recite the new and useful features thereof in the appended claims.

Figure 1 is a sectional view taken on the axis of the boiler. In this view some of the parts are shown in elevation; Fig. 2 is a horizontal section through the heater taken on the line 2—2 of Fig. 1; Fig. 3 is a horizontal sectional view taken on the line 3—3 of Fig. 1, but with the baffle plate omitted and shows in detail the construction of one deflector ring; Fig. 4 is an enlarged sectional view of one of the connecting devices used to connect the internal tubes with the crown of the heater and with the circular wall of the tapered internal member of the heater.

Similar reference numerals and letters designate like parts throughout the several views.

The base, designated as a whole by numeral 6 is preferably an octagonal casting having a flat bottom. A door 7 is hinged on the base and has a valve 8 controlling the supply of air in the interior of the casing. A ring 9 is secured on top of the casting and has an integral circular flange 9a adapted to keep the body of the heater in place on the base. The grate 10, which may be of any usual or convenient construction is supported by and detachably connected with the ring 9.

The body of the heater is a cylindrical sheet metal structure of suitable dimensions

and suitable gauge varying according to the size of the structure and the conditions of use. I prefer to use open hearth flange steel weighing, say ten pounds to the square foot, approved by U. S. Government stamp. The body of the heater comprises a cylindrical outer shell 12, a circular crown sheet 13, an annular bottom 14 and an inner tapered circular shell 15 in the form of a frustrum of a cone, suitably riveted and welded together.

A thick insulating covering 16 preferably of fibrous asbestos fabric, surrounds the shell 12 and prevents outward radiation of heat.

Clean out openings adjacent to the bottom 14 are closed by plugs 18 which may be removed when it is necessary to clean out the boiler and may be replaced when the cleaning is completed.

A standard water gauge 19 placed in any convenient position on the heater, indicates the level of the water in the boiler.

A standard steam gauge 20 is tapped into the crown sheet 13 and indicates steam pressure. A standard safety valve 36 controls maximum steam pressure within the boiler.

Annular concavo-convex deflectors 21 preferably of Shelby seamless steel are welded on the inner wall of the tapered shell 15. Circular series of openings 22 communicate with the interiors of the respective deflectors and permit free circulation of water in the deflectors thereby avoiding over-heating of the metal.

In addition to providing free circulation of water as described, the annular deflectors serve to stiffen and strengthen the tapered shell.

I have shown a series of sixteen water-circulating tubes 23 within the shell 15, but a greater or less number of tubes may be used without departure from my invention. The tubes 23 are all alike, so a description of one will suffice for all. These tubes are preferably made of $\frac{3}{8}$ " #20 gauge, seamless copper tubing. This tubing is very desirable and effective for the purpose because it is thin, light, and easy to handle; can be obtained at relatively small cost and is not subject to corrosion and is slow to accumulate scale.

A circular series of unions 24 are tapped into the crown sheet 13, one union for each tube.

A circular series of unions 24a are tapped into the wall of the shell 15 at a point below the established water level in the heater. Each tube is bent as shown at 23a between the deflectors 21. The upper end of each tube is provided with a heavy brass ground nut 25 which screws onto the union 24; and the lower end of each tube is provided with a similar nut 25a which screws onto the union 24a. Water from the boiler enters the tubes through the unions 25a and in its upward passage through the tubes is quickly converted into steam which enters the steam space in the boiler through the unions 24.

The two U-shape super-heater tubes 30 are preferably $\frac{1}{2}$ " seamless copper tubes. Each tube 30 has one end detachably connected with the crown sheet by a union 31 having a heavy brass nut 32, similar to the means already described for detachably connecting the circulation tubes with the boiler. The other ends of the tubes 30 are tapped into bosses 33a on the bottom of the chamber 33.

The tubes 30 extend downwardly somewhat below the lower deflector 21 and hang directly over the fire in the combustion chamber.

A horizontal flat circular baffle plate 34 is supported on the tubes 30 and occupies a space bounded by the curved parts 23a of the tubes 23.

Between the deflectors 21 there is a concentrated heat zone C which serves effectively to convert into steam the ascending water in the tubes 23 and to superheat the steam from the boiler going through the tubes 30 to the chamber 33.

A sheet-metal hood or smoke-box 26 is detachably connected with the boiler by any suitable means. The smoke-box has a hinged check-draft door 27, and a pipe 28 conveying smoke from the box to the chimney.

Owing to the small calibre of the circulating tubes 23 and their location in the zone C the generating of steam is very rapid and it is therefore necessary to provide means assuring an automatically controlled water supply. Any suitable automatic feed system may be used for this purpose.

I have shown and described a heater adapted to burn coal, but it is obvious that the structure is equally adapted to use gas or oil for fuel without material change in the structure.

The circulating tubes 23 are $\frac{3}{8}$ " #20 gauge copper tubes; the super-heater tubes 30 are $\frac{1}{2}$ " copper tubes. They take steam at boiler pressure, circulate it through the tubes and deliver superheated steam into the chamber 33. I have shown four steam mains 50, each $\frac{3}{8}$ " steel tubes, directly connected with

8 radiators 51, each of approximately 150 to 200 square feet of effective radiation. The steam passing through the circulating tubes, the superheaters and the $\frac{3}{8}$ " mains, reaches the radiators at approximately the maximum temperature and expands within the radiators so that the heat produced in the combustion chamber is effectively applied in the radiators.

Having fully described my invention what I claim as new and desire to secure by Letters Patent is:

1. A heating boiler comprising: a cylindrical outer shell closed at both ends; a tapered inner shell in the form of a truncated cone, open at both ends and having steam-tight connection with said outer shell at top and bottom of said truncated cone, said inner shell being adapted to form a combustion chamber; a superheated-steam receptacle above the open upper end of said inner shell; a pair of concavo-convex annular deflectors forming water rings in steam-tight juncture with said inner shell and adapted to receive water through holes in said inner shell; and U-shaped superheater tubes, extending through the zone bounded by said deflectors, receiving steam from the boiler and delivering superheated steam to said receptacle.

2. A heating boiler comprising: a cylindrical outer shell closed at both ends; a tapered inner shell in the form of a truncated cone open at both ends and having steam tight connection with said outer shell; a smoke hood above said shells; a superheated-steam receptacle within said hood above the open upper end of said inner shell; depending U-shaped superheater tubes in operative relation with said receptacle; a circular baffle coaxial with said inner shell and supported upon said superheater tubes; a pair of water-cooled concavo-convex annular deflectors in steam tight juncture with said inner shell spaced apart one above and one below said baffle, adapted to direct the gases of combustion and further adapted to stiffen said inner shell; and a circular series of upright quick-steaming tubes of relatively small calibre and thin walls having substantially vertical straight elements and outwardly bowed intermediate elements extending through the zone between said baffle and said deflectors.

3. In a vertical steam boiler, the combination of: an inner shell; a pair of water-cooled annular deflector elements spaced apart, one above the other, on the inner surface of said shell; a horizontal circular baffle plate coaxial with said inner shell, at an elevation intermediate between said deflector elements, and adapted to coact with said deflector elements to direct the gases of combustion; and a circular series of interchangeable upright steam-generating tubes, between said baffle and said deflectors, each tube being arched outwardly

around the edge of said baffle in the zone between said deflectors.

4. In combination: a first compartment having the form of a truncated cone open at the top and adapted to serve as a combustion chamber; a second compartment, surrounding said first compartment, having the same height as said first compartment, and adapted to serve as a water and steam chamber; an annular crown plate capping said second compartment; a smoke compartment above said first compartment, covering part of said crown plate and adapted to receive gases of combustion through the open end of said first compartment; a receptacle in said smoke compartment coaxial with said first compartment and connected to receive and deliver superheated steam; interchangeable superheater tubes each having an outward and downward terminal crook within said smoke compartment connected to take steam upwardly through said crown plate, a U-shaped body portion depending in said first compartment, and a straight terminal portion connected to discharge superheated steam upwardly into said receptacle; and interchangeable thin-walled steam-generating tubes of relatively small calibre arranged in a circle around said superheater tubes, each having an outwardly bent lower terminal portion connected to take water from said second compartment, a substantially vertical body portion in said first compartment, and an outward and downward bend in said smoke compartment connected to deliver steam downwardly through said crown plate.

5. In a vertical steam boiler, the combination of: an inner shell; a pair of U-shaped superheater tubes depending within said inner shell; a horizontal circular baffle plate supported on said superheater tubes in a position coaxial with said inner shell; a pair of water-cooled annular deflectors attached to the inner surface of said shell, one above and one below said baffle plate; and a circular series of steam-generating tubes extending upwardly between said baffle plate and said deflectors and having outwardly arched elements at an elevation corresponding with said baffle plate.

6. In a quick steaming boiler, the combination of: a plurality of substantially vertical steam-generating tubes having communication with the water space of the boiler at their lower ends, having communication with the steam space of the boiler at their upper ends, and each having an outwardly arched element in an intermediate part; depending superheater tubes in the central space surrounded by said steam-generating tubes; and a horizontal baffle plate supported by said superheater tubes at a height corresponding to the arched elements of said steam-generating tubes.

7. In a vertical heating boiler the combination of: a conically tapered inner shell adapted to concentrate the stream of flue gases at the top thereof; a smoke hood over the top of said shell adapted to receive the gases from said shell; a receptacle for superheated steam wholly within said hood, above the top of said shell and adapted to be entirely surrounded by flue gases; depending U-shaped superheater tubes connected to the bottom of said receptacle; and steam delivery pipes connected to the top of said receptacle and leading upwardly through said hood.

8. In a vertical boiler having a substantially horizontal crown plate, a uniformly tapered combustion chamber and a smoke hood surmounting said crown plate and said combustion chamber, the combination of: a receptacle for superheated steam directly above said combustion chamber and wholly within said smoke hood; and U-shaped superheater tubes depending in said combustion chamber, having one leg terminally recurved outwardly and downwardly above said crown plate within said hood, whereby to receive steam upwardly through said crown plate, and having the other leg connected to the bottom of said receptacle, whereby to deliver superheated steam upwardly into said receptacle.

9. In a boiler having a plurality of water tubes within an inner shell: a water-cooled stiffener and deflector encircling the water tubes and adapted to stiffen said shell and to direct the gases of combustion in relation to said water tubes, consisting of a unitary annular member of constant concavo-convex cross section having its edges contiguous with said shell and having the space between said shell and the concave surface of said annular member adapted for circulation of water through holes in said shell, substantially as set forth.

10. In combination with the inner shell and the crown plate of a vertical boiler; a plurality of thin-walled quick-steaming tubes of relatively small calibre, each comprising a vertical substantially straight main portion having an outwardly arched member in its intermediate part; an outwardly directed L-shaped bend below said main portion having a terminal union fitting adapted for detachable connection to a nipple in said inner shell; and an outwardly directed inverted U-bend above said main portion having a terminal union fitting adapted for detachable connection to a nipple in said crown plate.

11. In a vertical boiler the combination of: a crown plate having a relatively large central opening; two series of upwardly extending nipples in said crown plate; a smoke hood covering said opening, said nipples and a portion of said crown plate; a receptacle for superheated steam above said central

opening and wholly within said smoke hood;
U-shaped superheater tubes connected to the
bottom of said receptacle, depending through
said opening, and each having an outwardly
5 and downwardly bent terminal portion above
said crown plate, within said smoke hood,
connected to one series of said nipples; and
water tubes each having an upright main por-
tion extending through said opening, and an
10 outwardly and downwardly bent terminal
portion, above said crown plate within said
smoke hood, connected to the other series of
said nipples.

12. In a steam boiler the combination of: a
15 crown plate; a conically tapered inner shell
terminating in said crown plate; a smoke
hood surmounting said crown plate; and a
plurality of circularly arranged quick-steam-
ing tubes having their lower ends removably
20 connected to nipples in said inner shell and
having their upper ends outwardly and down-
wardly recurved within said smoke hood and
removably connected to nipples in said crown
plate.

25 13. In combination with the crown plate
of a vertical steam heating boiler; superheat-
er tubes each comprising a depending U-
shaped body portion; an outwardly directed,
downwardly bent terminal portion above
30 said crown plate, having a terminal union
fitting adapted for detachable connection to
a nipple in said crown plate; and a straight
upwardly directed terminal portion extend-
ing higher than said bent terminal portion
35 and adapted for detachable connection to a
superheated-steam receptacle.

In witness whereof I have signed my name
to this specification at Springfield, Illinois,
this 19th day of May, 1928.

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JOHN MARTIN MERZ.

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